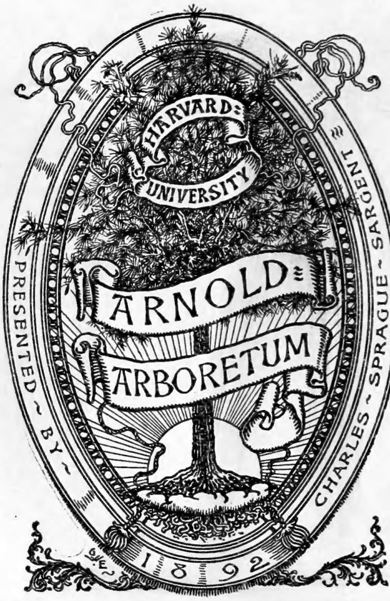
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1892

AGRICULTURAL BULLETIN

STRAITS

AND

FEDERATED MALAY STATES.

NEW SERIES Vol. I.

EDITED BY

H. N. RIDLEY, ESQ., M. A., F. L. S.
Director of Gardens, S. S.

SINGAPORE:
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No. 1.] OCTOBER, 1901. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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PROSPECTUS

OF THE

AGRICULTURAL BULLETIN

OF THE

Straits and Federated Malay States.

SINCE 1891 a Bulletin dealing with Agri-Horticulture and other cognate subjects has been published by the Gardens Department at irregular intervals. Up to the present some nine numbers have been published and of their utility there can be no doubt: indeed, so much have they been appreciated by the Planters in the Colony, the Federated Malay States and others, that a desire has been expressed that, having regard to the large and increasing number of Agriculturists and others taking an interest in Agriculture, the time has now come when something more than the Bulletin mentioned above is required.

2. It is now proposed to publish a monthly Bulletin, which shall incorporate the old one, and as far as possible enlarge its scope by making it the medium for the exchange and record of Planters' experiences in all that pertains to their interests.

3. The lines on which it will be conducted will follow to a large extent those of similar publications in other Countries, such as the Agricultural Bulletins of Australia and some of the West Indian Islands, especially Jamaica, and it will among other things include :—

(*a*) Leading Articles by the Editor and others.
(*b*) Articles on Forestry, Labour Supply, Soils, etc , etc.
(*c*) Extracts.
(*d*) Entomological Notes, Insect and Fungus Pests, etc.
(*e*) Reports of Meetings of Planters' Associations and their Annual Reports. Reports on Agricultural Shows in the Colony or Federated Malay States.
(*f*) Notes and queries.
(*g*) Correspondence.
(*h*) Market and Trade Reports.
(*i*) Weather Reports.

In fact its pages will be open to the widest possible extent to subjects of interest to the Planter, for whom in the main it is chiefly intended; it therefore cannot be too strongly urged that to make it a success, and of real use to them, each one should make a point of writing something, however small, each month, and thus in a word make it a Planters' Paper for Planters.

4. It is proposed that the Gardens Department shall continue to edit the Bulletin, as they are possibly in the best position for consulting Books of Reference; but I would here emphasise strongly the difference between editing a Paper and writing it. It is of the greatest possible importance that a band of contributors be organized, and this I think could best be done in the Federated Malay States by the Chairman of the United Planters' Association; in Penang and Province Wellesley by Mr. CURTIS, the Assistant Superintendent, Botanic Gardens, Penang. In Perak by Messrs. WRAY and DERRY, the Curator of Museums, and the Superintendent of Government Gardens respectively. In Selangor by Mr. ARDEN, the Federal Superintendent of Experimental Plantations; and, when appointed, by the Chief Forest Officer of the Colony and Federated Malay States. These gentlemen will, I feel sure, (if asked by the Government) be only too pleased to contribute to its pages and also collect copy in their respective districts and forward it to the Editor in Singapore. It is by this combination only that success can be achieved; and so far as the Gardens Department is concerned, no effort shall be spared to make it so. When possible illustrations will be reproduced.

5. Subscriptions payable in advance will be at the rate of $3.00 per annum, or fifty cents for a single copy, and will be received by the Superintendent of the Government Printing Office, Singapore, to whom all orders should be sent. Subscriptions will commence from the 1st of October next, the date on which the first number will be issued.

W. FOX,

Botanic Gardens.

Singapore, 1st August, 1901.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 1.] OCTOBER, 1901. [Vol. I.

THE TIMBERS OF THE MALAY PENINSULA.

Introduction.

When one looks over any large tract of country in the Malay Peninsula, especially from a height, and sees an apparently endless vista of forest, it is natural to suppose that the supply of wood suitable for all purposes is quite inexhaustible, but a more careful investigation into the contents of the forests themselves and an inspection of the timber in the yards of the sawmills, shows very clearly that the supply of first class timber for house and boat building, bridges and such purposes is not only not inexhaustible but is rapidly diminishing.

It is true that a large area of the interior of the Peninsula is not as yet accessible, the rivers being, as a rule, in forest regions, too small for floating timber down. While there is as yet but little of the country opened up by rail and the transport by such roads, as there are, is too expensive for full use to be made of the timber. The configuration of the country where so much of the land consists of a succession of hills with deep valleys between, makes it more difficult to get the timber out of the forest. This, however, is not usually insuperable, and probably in time most of the timber will be made accessible by slides, buffalo tracks, &c. In many forests, however, where there has been a certain amount of timber-cutting, one often finds that to see what big trees are in the jungle one has to go for some distance from the paths, as all good timbers that were accessible are naturally removed first, while even exceptionally good timber tree on slopes facing away from the track, even though but a short distance away, are untouched on account of the difficulty of extraction. Malay forests are almost invariably mixed forests. The most valuable timbers are scattered here and there among a vast quantity of inferior and mostly valueless woods. It is common to find forests consisting almost entirely of large trees of little value with only young

plants or stools of high class timbers, showing clearly that the first class timber was formerly plentiful but has all been extracted, yet an ordinary observer would never guess that the woodcutters had been at work here. As the larger higher class timber trees such as Kranji, Balau, Serayahs, &c., seldom fruit till they are of very large size, the constant selection of practically all the fruiting trees eventually completely exterminates them, as there is no possibility of their reproducing themselves. The same remarks apply to other jungle produce such as Gutta Percha and Rattans. In Pahang, near Pulau Tawar, I noticed that the rattan thickets, which were very dense, consisted almost exclusively of *Dæmonorops crinitus*, as a rule, a rather uncommon rattan and I found that this was considered by the Malays as valueless. The district being fairly populous and rattans in request, the natives had practically exterminated the useful kinds by taking the long stems before they had fruited, so the reproduction of these was impossible. In the same way Gutta Percha, though widely scattered over the Peninsula, was so persistently sought for and all trees big enough to fruit invariably cut down, that the plant ran a great risk of being absolutely exterminated, had not means been taken lately to protect and encourage the growth of the plant. Among the trees which have suffered most in this way are such valuable ones as Kranji, Chengai or Penak, Tampinis, Damarlaut and Balau. Though these trees appear to have been abundant enough to be used formerly in building, they have practically disappeared altogether from the Singapore sawmills, and are replaced by inferior timbers mainly obtained from Sumatra, Rhio, and Banca, and other Dutch islands. Chengai valued for boatbuilding is replaced by Penaga and Champedak Ayer. Tampinis one of the most indestructible woods formerly used for beams in houses is replaced by Balau and other inferior timbers, and even Jelutong which some years ago was considered good for nothing but clogs, models and such work is now worked up into planks as a substitute for Serayahs. Much of the timber also to be seen in the sawmills has a very large proportion of sapwood which is cut into rapidly perishable planks, for the bigger trees having been mostly used up, young trees are now constantly felled which have but little heartwood. Formerly these trees would not have been cut at all in the forests, but left till they had more fully developed.

Forests.—The trees in the South of the Peninsula are almost entirely ever-green, that is to say, the leaves are shed at no regular intervals but a few every few days, some remaining on the boughs for a very long time. A few trees are deciduous, suddenly shedding all their leaves, remaining bare for a day or two and then bursting out again into leaf. The deciduous trees are chiefly some species of *Ficus*, *Lagerstræmia*, *Terminalia*, *Cratoxylon*, *Parishia*, *Peronema*, and a few others.

Besides these, a number after shedding a large proportion of leaves, but not becoming bare, throw out a large number of fresh shoots the leaves of which are often coloured blue, red or white,

and then such trees usually flower. Though this may happen more than once a year, at apparently no particular season, all or nearly all trees of the same kind shed their leaves simultaneously. In the extreme north of the Peninsula, the Langkawi Islands and Siam there is a regular dry season and the trees all or nearly all become then as bare as trees in winter in England. There being no definite resting periods in our climate,the wood rings in the timber of cold climate trees are usually inconspicuous or absent, and as far as can be at present judged cannot be relied upon as giving the age of a tree. In timber from the north, however, where there are definite periods of rest, the rings are more clearly defined. The greater part of the forests of the Peninsula are of the same type, although certain trees are confined to higher altitudes than others and some trees are very local, others again seem to occur over the whole Peninsula. The *Dipterocarpeæ* (Serayahs, Damarlaut, &c.) occur on all the dryer hillwoods, but are to a large extent absent from the low swampy country bordering the tidal rivers. They are to be met with up to an altitude of 3,000 feet, but I believe seldom higher. The Oaks and Chestnuts grow usually in the low country and on the lower hills, becoming scarce at 1,000 feet, and soon disappearing altogether above that. Above 4,000 feet, the trees as a rule, are small, gnarled and irregular, but the wood is often very hard and compact. Tidal river forests are composed for the most part, of trees of the order *Rhizophoreæ*, generally known as Bakau mixed with Api-api (*Avicennia*), Nireh (*Carapa*), Dungun (*Heritiera*). The chief value of these except Api-api is for firewood, for which they are much in request, while the barks of several are strongly astringent and used for tanning and dyeing. The bigger trees of some of the Bakaus are also in request for piles, as the wood is very durable in water.

In some parts of the tidal rivers the Bakaus are replaced by Sonneratias, of which there are three species, one or two occurring where the water is quite salt, the other (*S. acida*) above the salt water. They are useful in many ways. Above the point where the salt water extends is also to be seen the Malebéra, *Fagroea fastigiata,* a most remarkable looking tree valued for piles.

Secondary growth (Belukar) when forest has been felled and burnt, put under cultivation and then abandoned, it is usually quickly covered by lalang, unless the ground is very sandy when fern springs up. Unless constantly burnt as is very often the case this ground is usually gradually reafforested naturally with secondary growth or Belukar. This is by no means always the case, as I have often seen patches of ground formerly under forest, which though unburnt for many years still bears nothing but lalang. The secondary growth usually consists of small trees of little value as timber, the following are the most characteristic :—

Tiup-Tiup (*Adinandra dumosa*), Durian Tupai (*Commersonia echinata*), Leban (*Vitex pubescens*), Mahang (*Macaranga hypoleuca,* (*M. javanica*) *Grewia umbellata, Symplocos fasciculata,*

Eurya acuminata, Morinda tinctoria, Pithecolobiums, Glochidian and in some places Tembusu (*Fagroea fragrans.*)

Ground under Belukar often remains so for many years even if not burnt, but in time second class timbers, Oaks, Shoreas, Artocarpi and other trees appear and eventually after the lapse of many years may again become good forest. That is to say seed of the better timbers may drift into the Belukar, and as they grow up may gradually replace the inferior kinds. This, however, depends much on the proximity of good forest with adult fruiting trees, and even in such a case ground often remains under Belukar apparently for an indefinite period.

Wood-structure.—When trees have attained a certain age, there is, as a rule, a more or less distinct separation in the timber into heartwood or sapwood, and the proportion of the two form an important factor in deciding the value of the tree as timber. The outer sapwood is usually white and soft and valueless. The heartwood in which the wood cells have increased much in thickness is often distinctly coloured and is the most valuable part of the timber. It may be coloured red or brown, or even black as in the case of Ebony. Trees vary very much in the thickness of the sapwood. In some, such as Cassia siamea, the proportion of heartwood is very small, while in Damarlaut the whole tree appears to consist of heartwood. As a rule, the proportion is the same approximately for the same kind of tree, but certain trees are most irregular in this. I have seen very large trees of *Albizzia Moluccana* felled in which the wood was soft and white all through, while trees of the same size or even smaller, contained a considerable proportion of brown heartwood. The sapwood is usually very soon destroyed by termites and fungi, and natives in felling such trees as Rengas (*Melannorhœa*) often leave the trunk in the forest till the termites have destroyed the sapwood entirely, when they remove the heartwood which is not touched by these insects. The proportion of sapwood to heartwood depends most on rapidity of growth. Many quick-growing short-lived trees make nothing that can be called heartwood, the wood all through being soft and white, such are the common wild figs. These soft woods are known to the Malays as Lampong. They are not necessarily useless; being light they are used for floating heavier timbers down stream and some are used for making boxes, models and clogs, and such like articles.

Rings.—As has been remarked the rings of our timbers cannot at least always be relied on as giving the age of a tree. I have been unable, however, to make many examinations as to this, because of the difficulty of finding out the age of any given tree accurately as there have been but few records kept of tree planting. A specimen of the Krian (*Eugenia grandis*) of which the age 16 years was known gave a corresponding series of annual rings.

Pores—are really the mouths of the vessels in the wood seen in transverse sections. They vary very much in size in various timbers, in some they are very minute while in others they are large and conspicuous. This is especially the case in the woody

climbers. Roughly speaking woods with large pores are softer than those with small ones. The pores are sometimes arranged in groups, or lines, and their size, position and arrangements are often very useful in determining woods.

Medullary rays—appear in transverse sections as bars, radiating from the centre of the tree to the circumference in longitudinal section as broad bars, often shining and of a different tint from the surrounding wood. In the Oaks and Chestnuts they are very conspicuous and form what is known as silver grain.

Concentric lines—are very fine lines of soft tissue occurring in many timbers. They are often wavy and sometimes very close together.

Weight.—The weights given in this paper are estimated from the weight of hand specimens, and are the weights per cubic foot. Where not otherwise mentioned or are marked *S* they are from specimens in the collection of the Botanic Gardens. For comparison I have added weights from other publications where obtainable. As the weights have been mostly taken from small specimens they must be considered rather as comparative weights than actual weights per cubic foot.

Literature.—The only works published previously on the timbers of the Peninsula are:—

Notes and Experiments on the different kinds of timbers in ordinary use in the Straits Settlements, by HOWARD NEWTON, 1884, and an article in the Kew Bulletin 1890, p. 112.

The former of these papers deals with about twenty of the better known woods, several of which, however, are imported from various islands in the Archipelago.

Experiments were made as to their strength and stiffness. All are mentioned by their native names, but a few scientific names are given, several of which are incorrect. In the second paper, based on MAINGAY'S Manuscript and specimens, the Malay names are much misspelt and often wrongly identified by some confusion. There is a short description of the timber, its use and weight.

Besides these papers, I have referred to GAMBLE'S Indian Timbers, a most carefully compiled and useful work and VAN EEDEN, Hout Soorten Van der Nederlandsch Oost-Indie (1886.)

There still remains a great deal of work to be done in the Malay timbers, some of which have not yet been properly identified, no adequate specimens of fruit and flowers having yet been obtained of some species, so that it has been impossible to determine to what trees the timbers belong. Malays in different places often use different names for the same plant, which causes some confusion, and it is not always easy to find a native who knows the correct names for various trees. The dealers in timber have at times attempted to introduce English names such as rosewood, Straits mahogany, Straits teak and the like. These useless names even when identifiable are better dropped, as they are apt to mislead people into the idea that the timbers referred to are related

to or at least resemble the real rosewoods and teaks which they do not.

Uses of Woods:—

For convenience of reference I give here the names of the most valued woods for various purposes with the names of the orders to which they belong.

First class hardwood building timbers—

Penak, Chengai, Damar Laut, Camphor, *Dipterocarpeæ.*
Merabau, Kranji, *Leguminosæ.*
Balau, *Rosaceæ.*
Tembusu, *Loganiaceæ.*
Niato, Daru, *Sapotaceæ.*
Tampinis, Keledang, *Urticaceæ.*
Kelat, *Myrtaceæ.*
Petaling, Kulim, *Olacineæ.*

Second class woods for planking, &c.—

Seraya, Meranti, Mersawa, *Dipterocarpeæ.*
Kumpas, Angsana, *Leguminosæ.*
Rengas, Mbachang, *Anacardiaceæ.*
Geronggang, *Hypericineæ.*
Jelutong, *Apocynaceæ.*

Piles, poles, scaffolding—

Penaga, Bintangor, *Guttiferæ.*
Gelam, *Myrtaceæ.*
Bakau, *Rhizophoreæ.*
Mata keli, *Legnotideæ.*
Malebera, *Loganiaceæ.*
Nibong, *Palmæ.*

Tool handles, &c.—

Matopus, Ceylon ironwood, *Guttiferæ.*
Nipis kulit, *Melastomaceæ.*

Boat Building—

Penak, *Dipterocarpeæ*
Penaga, *Guttiferæ.*
Perupat, *Lythrariæ.*
Champedak Ayer, *Urticaceæ.*
Krian, *Myrtaceæ.*
Bungoh, *Lythraceæ.*

Firewood—

Bakau. *Rhizophoraceæ.*
Nireh, *Meliaceæ.*
Ru, *Casuarineæ.*

Ornamental Woods—

Ebony, *Ebenaceæ.*
Kamuning, Catinga, *Rutaceæ.*
Champaca, *Magnoliaceæ.*

Fungi destructive to living trees.

In a hot and damp climate like this, it may well be expected that trees would be attacked by parasitec fungi and this is often the case. Trees wounded by accident or carelessly pruned are very

liable to attack, though a large number of trees are provided with latex, resins, or gums, which close up a wound speedily and prevent the Dlodgement of the fungus spores. Trees not thus protected are very apt to suffer. Thus the Tembusu, when cut or badly pruned is attacked by a black fungus which often damages it seriously. The woody fungi *Polyporus, Polystictus, Fomes*, etc. are among the most destructive parasites, and the appearance of the bracket-like fructification on the trunk of a tree, almost certainly signifies that the host is dying. Even more destructive than these are the root parasites, *Rosellinia* etc. (*See* Bulletin No. 9, page 285) which destroy all plants within a certain radius of the first infected tree.

The timber destroying fungi of Europe have received some attention from the European Foresters, but at present little has been done in those of the tropics. The destruction to forests by some fungi in Europe and North America has been enormous, but less damage is likely to be caused in our natural forests, as they are not as in colder countries composed exclusively of one kind of tree so that the infection is less likely to spread here, in the way that it does in Europe.

Fungi destructive to cut timber.

The chief cause of the decay of timber is due to the attacks of fungi, the growth of which is often very rapid. The spores germinating under loose bark, or in cracks, or on the cut surfaces develope the mycelium which penetrates the wood eventually breaking it up. Some very hard timbers remain for many years quite unaffected by fungus attacks, even in the most favourable situations for their attacks, but most are sooner or later destroyed. Where beams are so placed in buildings that they rest on one another especially if in the dark, and where there is no current of air, they are very liable to attack, and their destruction is very rapid, and it is very common to find beams perfectly rotten at the ends where they rest on each other, though quite sound in the more exposed centre. When the mycelium has developed to a certain extent and the weather is suitable, the fructification of the fungus is produced, and the appearance of this which is commonly taken to be the whole of the fungus may be taken as evidence that the wood is much injured and the beam if in a building no longer safe.

Soaking the timber in a solution of copper sulphate before using it will disinfect it of any spores which may be on it and for a long time at least prevent the attacks of any fungi, and indeed of insects also.

Among the most destructive of the fungi, are the following:—

Polystictus sanguineus, a brilliant red leathery fungus, bracket shaped, about 2 inches across and comparatively thin. It is common everywhere.

P. lilacino gilvus, a thicker lilac-coloured species.

Schizophyllum commune, a very common small greyish white fan shaped plant.

Lentinus exilis, Berk, a cup-shaped brown fungus.

Guepinia spathulata, a small soft flattened and branched orange yellow fungus.

DILLENIACEÆ.

Of the five genera of this order occurring in the Peninsula, *Delima* and *Tetracera* are strong growing climbers and *Acrotrema* is a herb. The others *Wormia* (6 or 7 species) and *Dillenia* (5 species) are trees or large shrubs. They are all somewhat similar in their large leaves and usually showy white or yellow flowers, rarely apetalous, and are generally known to the Malays as Simpoh or Chimpoh.

Wormia meliosmæfolia, King, Simpoh hutan.

A common tree in the hill woods, with soft velvety leaves, yellow acid fruit, often eaten. Attains a height of about 30 or 40 feet. It is used in house building but is not of much value.

W. tomentella, Bl.

A medium sized tree, with large yellow flowers chiefly occurs in the South of the Peninsula. The wood is light brown rather soft, with rather broad rays alternating with narrower ones and few small pores. Weight 54 lbs. per cubic foot.

W. pulchella, Jack.

A fair sized tree attaining a height of about 60 feet, with red rough bark, and rather small dark shining green leaves, flowers light yellow. Common in damp wet woods. Wood red heavy and compact fairly hard, pores moderate size, rays rather distant, broad and narrow mixed, with very fine intermediate rays. A good wood.

Dillenia indica, L.

A fairly large stout tree with very large white flowers, occurs along river banks in a few places, and is sometimes cultivated. A slow grower and rarely a tall tree, but fairly stout. The wood is red, rather coarse grained with numerous pores. It is not common in the Peninsula. The wood is good for building, and used in Java for telegraph poles (VAN EEDEN), and in India for shelves and gunstocks. Weight 41 to 49 ℔s. (GAMBLE).

D. aurea, Sm.

An uncommon tree occurring in Perak and Pahang, with showy yellow flowers. Wood grey mottled and wainscoted. Weight 48 to 49 ℔s. (GAMBLE), used for the interior of houses but not durable (VAN EEDEN).

D. ovata, Wall and *D. reticulata,* King,

are also trees which, however, are rare and little known.

MAGNOLIACEÆ.

There are six genera of this order here, of which one *Kadsura* is a strong woody climber, while the rest are trees and shrubs. The greater number occur only at considerable elevations, from

2,000 feet altitude upwards. Few of them are of any value as timber. The genera represented in the Malay Peninsula are *Magnolia.*

Manglietia, three species, *Michelia* two species, *Talauma* 3 and *Illicium* one or two.

Michelia Champaca, L. and *M. montana,* Bl.

Are said to occur in the forests of the Peninsula, but I have only seen them in cultivation. The former "Champak" of the Malays is a medium sized tree with smooth grey bark, and is readily known by its sweet yellow flowers. The tree reaches eight feet in girth in India, but I have seen none nearly as large here. The wood is very durable, hard and heavy, sapwood white, heartwood yellowish brown, close grained with very irregular rings, pores very small.

In India it is considered valuable for planks, panels, carriage-work and canoes, and trees cut in the Botanic Gardens, Singapore, quite bore out the excellency of the wood. It is easily raised from seed and in good soil grows fairly fast.

M. montana, Bl.

The white Champak is rather a larger tree, with broader dark green leaves and white flowers. It seldom fruits and is difficult to propagate.

Both species have a tendency to branch much when isolated. They would probably grow taller and more suitable for timber if planted among other trees.

Illicium cambodianum, Hance and *I. evenium,* King.

Are small trees about twenty feet tall and six inches through, with rough scaled bark and thick dark green leaves. The flowers are borne on the branches, singly or two or three together or in tufts or knots on the lower part of the stem. They are about an inch across with eight or nine petals rose coloured. The fruit consists of 8 to 12 beaked follicles radiating in a circle and each containing a seed. The trees occur at from three thousand feet altitude upwards, and are to be met with in Perak, Thaiping hills, Mount Ophir, Kedah Peak and Bukit Kutu in Selangor.

The wood is brown and close-grained, the rings inconspicuous, pores minute, rays conspicuous, fairly hard and heavy.

The tree is too small for much use but might be used for small cabinet work as the wood is of a good colour.

PIERRE (Flore Forestiere de Cochin Chine) says that the young fruits, leaves and bark are very aromatic, but I never observed this.

Weight (S.) 63 lbs.

Anonaceæ.

A large order of trees and shrubs of which few attaining any very large dimensions and many are climbers of no economic value. The timber is usually rather soft, generally white or yellowish, remarkable for possessing fine wavy bars connecting the medullary rays.

Drepananthus.

There are two species of this genus here, both tall straight trees, 30 to 60 feet tall and 6 to 8 inches through, with horizontal branches. They are *D. pruniferus* (Maing.) Antoi putih and *D. ramuliflorus* (Maing.) Antoi hitam. The wood is very similar in both white and light, floating in water with rather distant rays and large pores. Weight (S.) 4 lbs. 8 ozs.

The trees are considered good for house building but are not durable.

Cananga odorata, Hook fil. Kananga.

A tall rapidly growing tree, often cultivated for its sweet scented flowers, attains a height of about 60 feet and a diameter of 2 feet with straight bare stem. The wood is white with conspicuous rays and fine transverse bars and large pores. It is very soft and of little value, but is much in request by Malays to make tom-toms, being said to be very resonant, and used in house building in Java (Van Eeden). Weight (S.) 21 lbs. 2 ozs.

Goniothalamus Tapis, Miq.

A tall tree about 40 feet tall, is used in building in Java according to Van Eeden. It is common in Perak and Penang.

Polyalthia includes a number of small or medium sized trees, suitable for poles, house building, etc. The structure of the wood is similar in all, light yellowish brown, with irregular rays some broad with finer ones between, transverse bars very fine and close, pores scanty and small.

P. Beccarii, King. *P. Teysmanni.*

The wood is prettily figured, and might be worth the attention of cabinet makers, but as a rule, the trees are rather small. *P. Jenkinsi,* Benth. is stated by Maingay to be used for verandah posts. The wood is yellowish white and does not split. Weight of a cubic foot 37 lbs. 11 ozs. They are common throughout the jungles.

Weight *P. Beccarii,* (S.) 3 lbs. 15 ozs., *P. Teysmanni* 2 lbs. 5 ozs.

Popowia.

These trees resemble those of *Polyalthia.* The commonest *Popowia ramosissima,* Hook fil. has a yellow wood fairly heavy with rather large distant rays, very numerous fine transverse bars.

A prettily figured wood. Weight, (S.) 6 lbs.

Mitrephora Maingayi, Hook fil.

A tree 20 to 50 feet or more.

Has a heavy yellowish wood with fine rays, undulating fine transverse bars, and moderately large pores broader than the rays. Weight 13 lbs. 2 ozs. Hill ranges of the interior.

Ellipeia nervosa, Hook fil. Girah, Kenchong.

Attains a height of about 20 feet tall. The wood is dark coloured rather heavy, sinking in water and not very durable. It is used in house building, and beams 5 or 6 inches square can be had.

Bixineæ.

Most of these are trees or shrubs few of which are even moderately large trees.

Bixa orellana, L. the Arnotto. Kasumbah.

A South American plant has established itself in many parts of the Peninsula, being cultivated for its seeds which supply a red dye. It is a shrub with very light pale wood with large pores and close rings.

Scolopia rhinanthera, Clos.

A thorny shrub growing near the sea coast has irregularly coloured reddish brown wood with rather large pores and very numerous inconspicuous rays. It seldom attains a large enough size to be of any use.

Flacourtia Cataphracta, Roxb. Rukam.

A thorny tree of small size, with a fairly thick trunk armed with long branched spines, usually cultivated for its fruit. The wood is very close grained and heavy, reddish brown in colour, rings very obscure.

Ryparosa.

A few small straight trees much resembling Baccaurea (*Euphorbiaceæ*).

R. Hulletti, King.

A slender tree with yellowish white wood with very small pores fairly large but not very distinct rings and numerous close wavy rays.

Rare, only found in Singapore.

PITTOSPOREÆ.

Pittosporum ferrugineum, Ait, Giramong.

The only representative of the order here, is a small tree, but sometimes grows to a height of 60 feet, rather bushy above with lanceolate leaves, corymbs of white flowers and orange capsules. Common on the sea coasts and dry spots inland.

Wood white, fine grained pores very small in clusters, fairly numerous, rays fine but rather distant, rings fairly distinct; weight 32 lbs. 2 ozs.

Polygaleæ.

Only two genera produce timber, *viz*:—

Trigoniastrum hypoleucum, Miq. Marajali, Mata Passeh. A slender tree attaining a height of about 60 feet with small white flowers. Not common.

The wood is close grained and heavy, yellowish fawn colour, with close wavy rings. Maingay notes that it splits much in drying and is used for making tables. Weight 45 lbs. 11½ ozs. per cubic foot.

Xanthophyllum, Limah Beruk.

About twenty species of medium sized or small trees, chiefly used for native house building, some being fairly durable.

X. ellipticum, Benn.

A medium sized tree with grey bark $\frac{1}{8}$ inch thick. Wood grey and fawn colour mixed, fairly hard, pores large irregularly scattered often divided, rays very close and fine. Concentric lines very close numerous and wavy. A fairly good wood but no great size.

X. Griffithii, Hook fil.

Wood yellowish white, grain coarse, splits in drying. Weight 44 lbs. $3\frac{3}{4}$ ozs. per cubic foot (Maingay).

X. obscurum, Benn.

A big tree with large globose woody fruits, attains a height of 60 feet or more. Common in Singapore, Dindings, etc.

Wood heavy fairly hard, yellowish grey, pores very large scattered, rays very fine and obscure with very fine innumerable transverse bars.

X. sp. A sample of wood labelled Limah Beruk from Johore Mills, is a fairly hard, rather light white wood, with very small pores and conspicuous rays, broad and fine mixed, with very fine transverse bars.

HYPERICINEÆ.

The only trees of this order here are a few species of Cratoxylon, of these the most important is *Cratoxylon arborescens*, Bl. "Geronggang" or Gonggang.

A tree about 80 feet in height, straight, without buttresses, a foot or more in diameter; bark grey with longitudinal furrows, leaves small coriacious oblanceolate. Flowers in terminal cymes deep red. Fruit a capsule with winged seeds. The timber is red, finely grained, with large pores, rings large and fairly distinct, rays usually conspicuously dotted. It somewhat resembles Serayah, and is used for planking etc. and for this is considered a high class wood. Maingay gives its weight as 32 lbs. 15 ozs.; (S.) 22 lbs. 12 ozs. and a specimen from Johore 12 lbs. 4 ozs.

Common in the south of the Peninsula.

C. polyanthum, Korth Lunchin, Mumpat Hitam, Derom.

A straight tall tree about 60 feet, and $1\frac{1}{2}$ feet through, without buttresses. The bark is red flaking off and falling at the foot of the tree like that of *Tristania*. The tree sheds its leaves periodically, just before flowering. The young shoots are red, fully developed leaves lanceolate. Flowers small dull pink.

The wood is rather heavy, light pinkish brown in colour, close grained, pores rather small, rings close and undulate. A good useful wood giving beams 5 to 6 inches square, but not considered as good as Geronggang. Weight 61 lbs. 15 ozs. (MAINGAY). (S.) 57 lbs. 10 ozs.

C. formosum, Benth. Mempitis, Semumpat.

A smaller tree than the other two usually about 20 feet tall, and about a foot through.

The tree sheds its leaves entirely twice or thrice a year, speedily replacing them by narrow bright red ones, the flowers appearing at the same time they are pink (rarely white) and very abundant, giving the tree a beautiful appearance The leaves eventually become ovate by the time the fruit is formed.

The timber is good, hard and flexible, and in good trees will square to 5 or 6 inches, but as a rule it is rather short. Pierre (Flore forestiere de Cochin Chine) gives its height as from 10 to 20 metres, and says it is used for masts, posts and all kinds of work requiring resistance and flexibility.

It grows well in comparatively poor soil, but attains a greater height in richer soil in woods. It occurs all over the Peninsula.

(To be continued.)

REPORT ON THE SYSTEM OF RICE CULTIVATION PRACTISED IN PAHANG.

THE following interesting Report on the Cultivation of Rice, in Pahang, was prepared by the Acting Resident, Mr. D. H. WISE, for the information of the Government of the Federated Malay States:—

2. There are three descriptions of rice or *padi* land in this State. Descriptions of *padi* land.

(i). Wet or swamp land, known locally as *bendang, paya* or *sawah*.

(ii). Plough land or *tanah tenggala*.

(iii). Hill land, known as *ladang*, *tanah tugal* or *huma*.

3. From statistics collected by the District Officers, I find that the approximate number of acres under cultivation in each district is estimated as follows:— Area under cultivation.

District.	Ulu Pahang.	Temerloh.	Pekan.	Kuantan.	Total.
Wet *Padi* Land ...	5,500	8,200	1,700	440	15,840
Plough Land ...	3,500	40	2,600	Nil.	6,140
Hill Land ...	4,000	200	900	320	5,420
TOTAL ...	13,000	8,440	5,200	760	27,400

4. Wet *padi* land, which alone of the three kinds can be planted annually without giving the fields a rest, is sometimes artificially irrigated, the water being in some cases brought a considerable distance in ditches, while in others the fields are situated in natural Description of wet *padi* land.

swamps. This latter is the common form of wet *padi* cultivation in Pahang. The depth of the water is regulated by means of small embankments of clay thrown up so as to divide the fields into rectangular sections of from an eighth of an acre in extent upwards. In swamps a single bank or dam at the lower end often regulates the depth of the water over a whole field.

Method of planting wet *padi.*

5. The seed is sown thickly in a nursery, the fields being meanwhile prepared for the reception of the plants.

The land, which has been lying fallow for three or four months since the last harvest, has become covered with grass and weeds which are destroyed by driving teams of buffaloes tied 5 or 6 abreast about the field until the weeds have been well trampled into the wet mud. When this process is completed the seedlings, which are now some forty days old, are pulled up by hand and planted out in bunches of three or four plants at intervals of one or two feet.

The crop takes from 7 to 9 months to ripen according to the species those kinds which take the longest being capable of producing the heaviest crops.

Comparison with Perak methods of cultivation.

6. The Perak Malays usually plough their *bendangs* by means of light wooden ploughs drawn by buffaloes and turn the water on to the fields afterwards, while in the Krian district, where the best crops in the Peninsula are obtained and are almost entirely cultivated by Foreign Malays, the land is cleared entirely by hand labour, the weeds being dug or chopped off just below water level with a *tajak,* an instrument consisting of a heavy straight blade about two feet long, fixed like a scythe on to a straight wooden handle and used with a long swinging stroke.

In the Negri Sembilan the fields are cleaned with a *changkol,* a kind of heavy hoe or mattock.

The Pahang Malay, however, depends entirely on his buffaloes to save him the labour of cleaning his fields, and this is the method which has been handed down to him from his fathers.

Average yield per acre of wet *padi* land.

7. It is difficult to estimate accurately the average yield, which varies with the quality of land and with the climatic conditions of each season. It may be roughly put down at from 35 to 70 bushels per acre, the average being probably 40 to 45 bushels.

Yield in Krian.

The Krian *padi* lands, which, as I have stated, are considered the best in the Peninsula, yield from 60 to 100 bushels per acre.

Plough land or *tanah tenggala,*

8. Plough land, known as *tanah tenggala,* consist chiefly of flat alluvial tracts, many of which are situated near the lower reaches of the Pahang river. This land is not irrigated, the crop being entirely dependent for such moisture as is provided by rain and dew. Owing to the uncertainty of the seasons, this sometimes proves insufficient, while at others the crops are destroyed by floods. Land which is annually flooded after the harvest gives the best crops.

Pough land clannot be

9. Plough land cannot be continuously cultivated year afte year. It is usually planted for three, four or five seasons in succes-

sion and then allowed to lie fallow for the same period, though in some few cases cultivation is carried on every alternate year. cultivated annually.

10. The land is prepared by ploughing and cross-ploughing it three times over with a light wooden plough shod with iron and drawn by buffaloes; the seed is sown broadcast, about a bushel to the acre, and cross-ploughed in, a harrow being sometimes used. The crop ripens in from 5 to 7 months producing from 25 to 35 bushels per acre. Method of cultivation of plough land. Yield of plough land.

11. Hill *padi* is generally grown along the sides of low hills but often on flat land above flood level *and nearly always in secondary jungle.* Hill *padi* land or *ladang.*

The land is prepared by first clearing the undergrowth; after which the larger trees are felled and left lying until sufficiently dry, when they are fired. The branches that escape the first burning are collected in heaps and burned, the larger tree trunks, which are not consumed, lying where they fell. Another clearing up and burning of the smaller twigs and rubbish then takes place, after which the land is marked out with stakes and the seeds sown several at a time in holes made with a pointed stick about a foot apart. Cultivation of *ladang.*

The crop ripens in 5 or 6 months, the yield being about the same as that from plough lands, namely from 25 to 35 bushels per acre. Yield of *ladang.*

12. The reaping and harvesting of rice crops of all kinds is conducted in the same manner. Reaping and harvesting.

The ears of ripe grain are snipped off, one by one, with a small circular knife held between the fingers. They are generally tied in bunches and the grain separated from the ear by treading it under foot. The corn is exposed for a while to the sun and the chaff is then got rid of by throwing the grain into the air out of a flat three cornered basket work dish made of rattan; the heavy grains fall back into the dish while the chaff is carried away by the wind. In some cases the grain is dropped on to a mat placed on the ground under a high open platform erected on poles, when the chaff is carried away, the full grains falling on to the mat.

The *padi* is then stored and when required for use is turned into rice with a heavy wooden pestle and mortar, an article to be seen outside any well appointed Malay house, and the grain parted from the husks by throwing it into the air from a dish in the manner already described above.

13. The work of cultivation is shared by men and women, the latter planting out the young *padi* grown in the swamps and reaping the crop and preparing it for use. Labour done by women.

14. In some parts of Ulu Pahang the crops are reaped by means of a *sabit* or reaping hook, said to have been introduced by Sumatran Settlers. This is a more expeditious method than that in common use; but the latter has the advantage of leaving longer straw, which manures the fields for the next crop. Reaping hook.

Production and consumption of rice by Malays.

15. The four District Officers—to whom I am indebted for the trouble they have taken in furnishing reports on this subject—have had much difficulty in arriving at accurate statistics as to the production and consumption of rice by the Malay population; but from the particulars which they have furnished, it may be estimated that in the districts of Temerloh, Pekan and Kuantan, the Malays, during a good *padi* season, grow on an average about enough rice for their own consumption; whilst in Ulu Pahang, where a proportion of the Malays are engaged in work connected with mining, the local crops produce about five-sixths of the rice necessary to support the Malay population. Much, however, depends on the rainfall which varies greatly, and in some years, owing to drought or floods, the crops fail entirely. The Chinese live almost entirely on imported rice.

Census.

16. A more accurate estimate could have been furnished of the relative production and consumption of rice after the Census, which is to be taken next month, but as it will be some time before the Census returns have been compiled, I have thought it better not to delay this report which is already long overdue.

Comparison of the three methods of cultivation.

17. Of the three methods of cultivation it is needless to say that the wet *padi* deserves the most encouragement; but in many places where Malays have settled for generations and possess houses and valuable fruit plantations, there is no water available for irrigation except at a prohibitive cost. These men are forced to content themselves with plough or hill land.

Printed reports published in 1893.

18. The subject of the encouragement of rice cultivation throughout the Malay Peninsula was dealt with in the printed reports furnished by order of His Excellency the Governor in 1893, and the recommendations made by the various officers from whom these reports were received were summarised and criticised by the Colonial Secretary, the late Sir WILLIAM MAXWELL, in his minute of the 28th January, 1893, to which I would refer you.

Prospects of increasing local production of rice.

19. The possibility of largely increasing the production by the present population is out of the question. The Pahang Malay can live during a favourable season on the production of the area now cultivated, and his ambitions will not urge him to exertions which he considers unnecessary. He has enough during a good season, and were he to plant double the present area it would benefit him little in unfavourable seasons, when the crops fail almost entirely through floods or drought. At such times he can with ease earn enough money to keep him by working on day wages or collecting jungle produce.

Foreign settlers.

20. The introduction of foreign settlers is the only means of largely increasing the local production, and, although there are doubtless areas of suitable land which could be irrigated, there is no prospect of inducing many foreign settlers to come in so long as the counter attraction exists in the Western States of an abundance of good land more easily accessible. Much, however, may be

done in the future when communications have been improved and funds are available for carrying out large and carefully planned schemes of irrigation in favourable localities.

21. The Government has, by passing a law under which the dates for the various stages of cultivation are fixed by local authority, attempted to prevent the destruction of crops by flood or drought, and the damage by pigs, rats and mice is also reduced by this means owing to the fields being cleared and planted simultaneously. Similar legislation has taken place in the Western States. Legislation for *padi* cultivation.

22. The most serious obstacle to the cultivation of the Pahang rice fields lies in the frequent attacks of rinderpest amongst buffaloes. The Pahang Malay is, as I have shewn, dependent on his cattle for the cultivation of both wet and plough land, and in districts which have been visited by the disease the crops have naturally suffered. Rinderpest.

23. The only remedial measure at present is the segregation of the affected herds, and this has been done as far as possible, but there is no doubt that the infection is spread by wild pigs and probably also in other ways, and the task of enforcing precautionary measures is no easy one. Segregation of herds.

If the experiment, now being made in Seremban, of inoculating buffaloes with the serum used so successfully in South Africa, proves effective a most important step towards the encouragement of rice cultivation throughout the Malay Peninsula will have been made. Inoculation cattle.

24. Buffaloes are peculiarly susceptible to rinderpest, and it is certain that something would be gained if the natives could be induced to import kine from Kelantan and Siam for the cultivation of plough land, as these beasts are less liable to attack and more frequently recover than do buffaloes; and it has been proved by Dr. BRADDON, who is carrying out the experiments referred to, that the serum process renders kine immune, while but little risk attends the operation. The inoculation of buffaloes has not so far been attended with the same success. Siamese and Kelantan cattle for plough land.

It would, however, be most unwise to introduce inoculation amongst kine whilst buffaloes remain unprotected, owing to the risk of infecting the latter with disease; and it is certain that while the dry plough lands could well be cultivated by bullocks, these animals would soon succumb if put to work in the irrigated fields and swamps for which buffaloes alone are suitable.

25. The crops could be improved by changing the seed more often than is done at present. When Acting Resident of Pahang in 1896, I obtained a supply of seed from Perak which was distributed amongst the natives at cost price. Unfortunately, most of the crops were destroyed that season by floods and only a small proportion of the seed came to maturity; but the experiment was a success in the fields which were not so damaged, and should, I think, be repeated occasionally. A great deal more could be Changing seed.

effected in this direction by inducing the people of the various districts of the State to exchange seed *padi* through their headmen, and I will give instructions to the District Officers on the subject.

Secretary of State's Despatch.

26. In your letter under reply you asked for a report on the system of rice cultivation practised in Pahang, and as the late Resident, Mr. BUTLER, had called for full information from the District Officers on this subject, I have attempted with the help of their reports to furnish the information required. I gather, however, from the extract from the despatch which you enclosed that the information specially desired by the Secretary of State had reference to the statement made by Mr. CLIFFORD that great waste of valuable timber was taking place owing to the cultivation of hill *padi* by Malays.

No serious damage done to timber.

27. This is a matter which has often been discussed in Perak and elsewhere; and, after enquiry and careful personal observation, both in Perak and Pahang, I am glad to state that I cannot find sufficient reason for the apprehension to which the statement in question has given rise. In support of my opinion I will quote the following passages from the reports of the District Officers of Pekan and Temerloh, who have served for many years in Pahang and have had special opportunities of studying the subject, Mr. FLEMING having been on different occasions in charge of each of the four districts of the State.

Mr. Fleming's opinion.

28. Mr. F. C. FLEMING, District Officer, Pekan, writes:—"I do "not consider that much valuable timber is destroyed in the dis-"trict by the cultivation of hill *padi*. The natives usually prefer "to clear secondary jungle for the purpose, and as this form of "cultivation has probably existed since Malays first came to the "State there is plenty of secondary jungle available along the "banks of the main rivers and streams. The practice of clearing "virgin jungle for the cultivation of hill *padi* has been discouraged "in this district as far as possible."

Mr. Townley's opinion.

Mr. E. F. TOWNLEY, the District Officer at Temerloh, writes as follows:—"There is no doubt that a large quantity of valuable "timber has been and is destroyed every year, more especially by "Sakais, who very rarely cultivate the same piece of ground twice, "but prefer to make new clearings in virgin jungle. The Malays "on the other hand prefer to clear secondary jungle."

With reference to the first part of this statement I would refer you to my paragraph 32 below.

No damage by hill *padi* grown in secondary jungle.

29. I have long held the view that so long as the cultivation of hill *padi* is restricted to secondary jungle it does no harm, provided that where wet *padi* or plough land is available the Malays are not allowed to shirk the labour of cultivating it in favour of hill clearings. This was the rule in the Kuala Kangsar district of Perak in 1887 and 1888, when I was in charge of the Land Department there and went fully into the question.

30. It is well recognized that the country Malays will not settle permanently unless they can plant *padi*, and there are places in Pahang where inhabited fruit plantations exist, but where no wet *padi* fields or plough lands are within reach. Adjoining such places, which are usually in hilly country, will be found considerable tracts of secondary jungle of which portions have been cultivated annually for many years, and the periodical cultivation of these areas entails absolutely no destruction of valuable timber.

Malays will not settle without *padi* land.

31. The area of hill *padi* under cultivation throughout the State is estimated at 5,420 acres, or less than 8½ square miles. The land used for this purpose is allowed to grow up in jungle for a period of from 4 to 7 years after each crop, and can be planted on an average once in six years.

Area of hill *padi* cultivated and area of secondary forest available.

To provide a sufficient reserve to allow the land a rest of five years after each clearing the area necessary to supply the present demand would be 32,520 acres, or under 51 square miles, representing about 1/280th of the area of the whole State, which is according to the latest estimate over 14,000 square miles in extent

These figures afford a practical illustration of the true state of affairs, and I am quite safe in stating that a very great deal more than 51 square miles of secondary jungle, which was originally cleared for *padi* planting long before British protection was introduced, is available, and this land carries no valuable timber.

32. Sakais, as Mr. TOWNLEY states, generally—though not always—clear virgin forest and so destroy a good deal of the more valuable kinds of timber; but, they usually take more than one crop of maize, yams and other produce off the land before abandoning it, and their clearings are almost, without exception, in such inaccessible places that the timber destroyed would not, at any rate for a great number of years, find its way to the market even if it were preserved.

Damage to timber by Sakai clearings.

Definite instructions have been issued to the District Officers to refuse to issue licences to Malays for the temporary cultivation of virgin forest, but the Government is not at present in a position to successfully regulate the planting operations of these hill tribes and the damage done by them is not, I think, sufficient to justify our interference.

EXTRACT FROM REPORT OF Mr. R. DERRY, SUPERINTENDENT OF GOVERNMENT PLANTATIONS, PERAK, FOR THE YEAR 1900.

PARA RUBBER (*Hevea braziliensis*).

The result of a parcel of this rubber sent to London for sale was received early in the year, all the best quality rubber, 327 lbs., sold at the rate of 3*s*. 10*d*. per lb., and the scrap, 33 lbs., at 2*s*. 6*d*

The nett proceeds amounted to £61 1s. 6*d*., or $617.18. I believe this to have been the largest parcel of Para rubber sent home from the East. It realised 6*d*. per lb. more than that sent home in 1898, and was reported on as "Para character".

The tapping commenced in March, 1899, and was carried on till July. It was intended to tap a few trees, those which ran most freely with a view of obtaining the maximum amount of latex without injury, and to obtain about 4—5 lbs. from other trees. This much could have been done, but owing to the exceptionally heavy rains which frequently interrupted the work, and in order that the seed crop should not be damaged, tapping was stopped and with several trees long before completed.

Altogether 82 trees were tapped with the following result:—

NOTE:—These figures are approximate. The weight has been computed from the number of tins of latex obtained from each tree. Three hundred and twenty-two lbs. dry rubber was obtained from 485 tins of latex, giving an average of $10\frac{1}{16}$ ozs. per tin when dry. The tins are 6 inches × 4 inches × 2 inches.

Average age of trees 14 years.
Present girth at 3 feet from the ground.

	No. of trees Tapped.	Yield per Tree, dry Rubber.		Total weight, dry Rubber.		Present girth		
		lbs.	ozs.	lbs.	ozs.	ft.	ins.	
	13	0	$10\frac{1}{2}$	8	$8\frac{1}{2}$			
	7	1	5	9	3			
	6	2	0	12	0			
	5	2	10	13	2			
	12	3	5	39	12			
	7	4	0	28	0			
	5	4	10	23	2			
	9	5	5	47	13			
	5	6	0	30	0			
	2	6	10	13	4			
	3	7	5	21	15	6 6 6	9 1 1	Measured 18 months
	2	8	0	16	0	6 5	1 3	After tapping.
	2	8	10	17	4	5 5	6 2	
	1	9	5	9	5	7	3	
	1	10	0	10	0	7	1	
	1	10	10	10	10	7	4	
	1	12	$1\frac{1}{2}$	12	$1\frac{1}{2}$	6	0	
Total...	82	...		322	00			

To this should be added 19 lbs. scrap, *i.e.*, rubber collected on the trees, making a total yield of 341 lbs., or an average of four and one-fifth lbs. per tree.

The average age of trees tapped is 14 years, taking the yield at 4 lbs. per tree, and estimating the trees at 100 to the acre, this would give a gross return of £73. 6*s*. 8*d*. at present prices, or at half the price, £36. 13*s*. 4*d*., and what other tropical product gives the same return? If the trees were only half this age, say 6—7

years, there would not be much difference in the gross result, then there would be double the number of trees to the acre.

The following figures on three samples accurately weighed are interesting as shewing the difference in weight between freshly collected latex and dry marketable rubber:—

Sample.		Fresh latex gross.		Tare of Tins.		Dry Rubber.		Difference.
		ozs.		ozs.		ozs.		ozs.
1	...	30½	...	6	..	13	...	11½
2	...	29¼	...	6½	...	13	...	9¾
3	...	29	...	6	...	11½	...	11½

Hevea Braziliensis in Perak.

At Kuala Kangsar there are two well marked varieties of Hevea, (1) the typical tree with large leaves attaining 13 inches long and 5 inches wide and generally branching low down; (2) smaller leaves, tall trunk and smaller rather pointed seeds, an inferior variety. The largest tree at Kuala Kangsar is 18 years old and has a girth of 8 feet 6 inches at 3 feet from the ground, this is larger than any observed by Cross in Brazil.* Some trees planted by myself 3 years ago have now a girth of 1 foot 3½ inches at 3 feet from the ground. Hevea trees have a short resting season, shedding their leaves about the end of February, its new growth commencing with flowers followed by leaves. It is not uncommon, however, to see trees in September, half or many branches dormant, and without a leaf, while other parts are covered with verdant foliage. The seeds from March flowers commence ripening in August, those from September flowers in February, the heavier crop being in August. Here Hevea trees are planted on dry ground and also low swampy ground. I have not observed any difference in yield of latex, but I would not recommend land which is liable to heavy floods.

Tapping.—I consider the latex flows most freely when the new leaves appear, which with most Hevea trees is about March, and the advantage of tapping about that time is not so much a question of actual yield as it is of the amount of bark removed in the operation, which would be less at the best season. There would also be another season commencing in September with those trees then flowering. As with all trees, the ratio of growth is variable at different periods, but taking the girth of Hevea trees here, a 3 year old tree at 3 feet from the ground being 13-15 inches, and an 18 year old tree 100 inches, the annual increment would average nearly 6 inches in circumference and I am sanguine that Hevea trees can be tapped in Malaya when 6 years old, if not earlier, when I estimate the girth at 24-30 inches on good free soil.† Tapping should be commenced at the base of the tree, working upwards to 6 or 8 feet if necessary, and if a tree be operated on in a workmanlike manner three annual tappings could be executed before going over old incisions.

* *Vide.*—Cross' report 1897 to India Office.

† In his report to the India Office Cross mentioned that Hevea trees of 6—8 inches diameter are tapped in Brazil.

Coagulation.

Samples of rubber prepared at Kuala Kangsar have been reported on as equal to good Para (Brazilian) and would fetch best Para prices. I have always found the latex to coagulate readily with only the addition of a pinch of alum and by placing immediately in smoke both putrefaction and mould are avoided. If the rubber is sound the market value depends on the state of dryness in which it is received. What has been prepared at Kuala Kangsar has been kept smoked until shipped. A parcel sent to London $3\frac{1}{2}$ years ago was reported to have lost $26\frac{1}{2}$ per cent. in washing and the manufacturers thought that if sent home in bulk the loss would reach 30 per cent. This, however, is a question for the planter himself, smoke has a chemical action in the coagulation of latex from Hevea * as well as saving decomposition, and assists in gradually drying. To be as dry as possible depends on the time the rubber has been kept smoked, and I am of opinion that dry marketable rubber could not be prepared under two months. Whether centrifugalization will prove a practical method with Hevea is still in its infancy. I understand that the globules of *caoutchouc* in the latex of Hevea do not separate readily, as is the case with some other latices, and owing to its chemical combination the latex of Hevea will be probably best prepared by the natural method.

Topping.

Some correspondence has reached me with reference to the advantages of topping Hevea trees. The only advantage I am aware of, would be the production of a heavy canopy which would assist in keeping down weeds. Otherwise it seems theoretically wrong. It has been proved by experiment and investigation that the latex runs most freely and contains more *caoutchouc* at the base of the tree, and the yield of latex in the branches is small and deficient in the essential properties of *caoutchouc*.† The trunk evidently performs its part as a manufacturing agent and should be left intact.

I have observed that trees which are "forked" low down do not yield readily. If not due to injury "forked" trees is caused by planting the seeds too deeply. The seeds should be pressed into the soil of a nursery bed, but never covered, as if so, the seeds germinate with 2 or 3 stems

Summary.

I have not seen any published accounts on Hevea (excepting Brazilian) where as good results are obtained as in Malaya, either in rate of growth, seed production, dimensions, yield and adaptability.

Rambong.

India Rubber (*Ficus elastica*). A sample of $5\frac{1}{2}$ lbs. was sent to London, with the Para parcel, for sale and opinion. It was reported

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* *Vide.*—Proff. Biffen's report.
† *Vide.*—Parkin's Ceylon Reports.

on as "good clean Java character" and valued at 3*s*. 6*d*. per lb., but sold for 3*s*. 10*d*.

The largest tree at Kuala Kangsar is about 90 feet high, measures 88 feet at 3 feet from the ground, measuring round all the aerial roots, the branches extend to 36 paces, and the largest leaves are 13″ × 7″, its age, 19 years. The growth of this tree has been remarkable during the last three years, from the time its aerial roots reached the ground.

Ficus elastica is an indigenous tree, found in Upper Perak. It is naturally an epiplytc, and its growth would be no doubt assisted if planted at the bases of felled trees. Its growth is slow at first but rapid when well established. Considering the enormous dimensions this tree attains, 10 to the acre would be close enough planting, and as perhaps 8 years would have to elapse before the tree could be profitably tapped the intervening spaces could be utilized by some other crop, even Hevea, which would be beneficial to the growth of the *Ficus*.

Tapping.

As the latex of *Ficus elastica* coagulates on the tree it is best to tap on dry days only. From single incisions, about 4 inches long, and rather more apart, the latex slowly exudes, and in 2 or 3 days afterwards can be collected. At times the latex runs more freely and then some drops to the ground, this can be collected on plantain leaves, but the quality is not so good as that which coagulates on the tree. At Kuala Kangsar, seeds ripen about October, the fruiting season being between July and October, and I should not think these the months for tapping. I consider December, January, and the following months best.

Yield.

I have not any information as to the age when *Ficus elastica* could be profitably tapped. At Kuala Kangsar there are two trees 12 years old, and two 19 years old, from the latter 25 lbs. of rubber has been obtained from each tree, and the tapping was far short of being exhaustive. The result of the other trees has not yet been ascertained, but I expect good results.

Getah Singret (*Willughiina firma*). A small sample was sent to London with the Para parcel, and reported on as "good strong Borneo character," valued and sold at 2*s*. 6*d*. per lb. This is the best of the indigenous creepers, but I doubt very much if it ordinarily reaches the European market in a pure state, being usually used to adulterate getah percha.

Getah Taban Sutra (*Dichopsis gutta var*). There is one example of this tree in the Kuala Kangsar garden which is said to be 17 years old, and fruited for the first time in November, 1900. A few herbarium specimens were obtained, all the other fruits being carried off by squirrels before being ripe. The height of this tree is 25 feet, and girth 2 feet at 3 feet from the ground, a jungle tree growing under heavy canopy would of course be much higher, with less branching habit, and smaller girth.

Central America Rubber (*Castilloa elastica*). About 150 seedlings of *Castilloa* from Ceylon seeds have been raised. It appears doubtful, however, whether the Ceylon trees are *Castilloa elastica* (true) or only an inferior variety, *Castilloa Markhamiana*. The results of Ceylon trees being far below South American returns.

Getah Percha (*Dichopsis polyantha*). A variety of getah percha which grows from near the foot of Larut hill to 3,000 feet. A mountain form which may prove valuable for planting on high land. None, however, were observed in fruit, and it is probable that with this tree, as with many indigenous trees, a fruiting season only occurs every few years. Seedlings are abundant, but the smallest seem two years old.

ON THE DISTRIBUTION OF (FREE) MEALS TO COOLIES ON THE ESTATES AND IRRIGATION WORKS, KRIAN.

By Mr. H. A. Haviland.

CHINESE.

Sinkehs —On all Chinese estates, where sinkehs are employed who live together in kongsi houses, there is a public cooking place, presided over by special cooks, for preparing food for these men.

The rice is provided for them at fixed rates and given to them cooked. Vegetables, fish, etc., they must provide for themselves. On holidays (Chinese) the estate provides them with pork, free. The price of the rice is, I believe, deducted from their monthly wages: no tickets are issued for it. Their first meal is before they go out to work, at 6. a.m.; their second meal at about 11 a.m.; the third meal about 5 p.m. after their work is over. Their working hours are from 6 a.m. to 11 a.m., from 1 p.m. to 5 p.m.

Laukehs cook for themselves, individually, or join in a kongsi and employ a cook; they live in what are called " rumah kechil " and work their own hours, their earnings depending upon their own exertions.

INDIANS.

Statute Immigrants are provided with daily (rice) tickets varying in value from 8 to 10 cents each. These tickets are given them in order to insure that they have money to buy food, otherwise an improvident man might spend his month's wages in a few days and have nothing left to carry him on in food until he receives his next wages. These tickets are collected in the "kedei," and the value of them deducted from the wages due to the man at the end of the month. It may happen that a man does no work for a month, either from indisposition or indolence; he has his rice ticket given to him, however, every day; but, at the end of the month, there will be to his debit a sum of $3 (*i.e.*, 10 cents a day for 30 days) and nothing to his credit for work done.

The Indian starts work at 6 a.m., and works on without a break till 2 or 3 p.m., it depending somewhat upon his task and his inclination to finish it. He always takes some food in the morning before he begins work, but it is not necessarily of good quality. It is often either half-cooked, or what is over from the previous day, in which case it is apt to be sour and fermenting. This is especially the case with the unmarried men ; those who are married fare better. To obviate this some estates have instituted "public kitchens" for the Indians, where they can obtain a freshly cooked and hot meal of rice almost at any hour of the day. The man can buy his meal of cooked rice with part of his daily rice ticket, as he previously bought his uncooked rice. By this means they can be sure of getting every morning, without any trouble to themselves, a good wholesome meal, before starting work. They generally also take some food with them into the fields to eat, when they feel inclined to do so.

This system has been working on Caledonia Estate (in the Province) for about three years, and is proving more and more of a success. At first there was much difficulty owing to caste prejudices, but by employing high caste men as cooks and by dividing the eating room into two separate compartments, these difficulties were obviated. It is found that the married man, as well as the unmarried, now comes for his morning meal before starting for work.

Gula Estate, during the last two months, has started this institution, and the men are beginning to take to it.

It is also to be instituted on Sungei Gedong Estate as soon as possible, and will, I hope, be with good results.

On Gula Estate the only men who have free rice given to them are those in hospital and "the convalescent gang" ; the latter used to be fed in the hospital, now they receive their cooked food at the "public kitchen," and the value of their "rice ticket" is not debited to them at the end of the month : it would be absurd to do so, as they are earning no wage.

THE FREE COOLIES look after themselves much in the same way as the Chinese Laukehs do ; they are paid by results, but of course they can make use of the "public kitchen," if they please, by paying for their cooked rice, by ticket or by cash.

ON THE IRRIGATION WORKS it was proposed to provide all Tamils with a cup of hot coffee, free of charge, every morning before going to their work. It was calculated that this could not be done for less than one cent a cup. There has been considerable difficulty in procuring apparatus large enough to provide coffee on this scale ; and, owing to this difficulty, it has not yet been put into practice. Whether the Tamils would drink it or not is a question that does not seem to have been raised.

It has since been proposed to give the Tamils a cup of hot rice congee, every morning, before proceeding to their work, free of charge. As can be seen from the above this is no new idea, and is now being, in part, carried out on some estates.

The Tamils here, as on the estates, take food before they proceed to their work, it may be good, it may be inferior (as has been pointed out above); and it would appear perfectly feasible and easy to institute a public kitchen wherever there are Tamils lines, in order that they may purchase their portions of wholesome food before proceeding to their work, as on the estates. They are now on the "rice ticket" system, are better paid than estate coolies, and thus it appears superfluous to provide them with this meal free of charge: the cost will be at least twice or three times the price of the coffee.

It is proposed to bring the institution of "public kitchens" into practice as soon as possible. Caste prejudices will have to be respected as on the estates, and it may be a little time before it will come into general use.

CHINESE.—With regard to the Sinkehs who live together in kongsi houses, the "public kitchen" system has been introduced and is working well. At first there was some grumbling, but now all goes smoothly.

The Chinese have a good meal of rice before they start for their work, without the trouble of cooking it for themselves: at 11 a.m., and at 5 p m., they also have good meals cooked for them. The Chinese are also provided, free of charge, with pork on Sundays (four tahils to each man), anything extra they can buy separately in the kedei, and cook for themselves.

These men are not provided with their morning meal free of charge, so why should the Tamils be? They work far harder and do far more work than the Tamils. The wages of both are good and there seems to be no necessity to provide the morning meal free.

DESTRUCTION OF PARA RUBBER BY CATERPILLAR.

BY MR. F. W. DOUGLAS, *Forest Officer, Perak.*

In February this year a caterpillar made its appearance for the second time at the Pondok Tanjong Plantation. The last occasion being in 1898.

The insect commenced feeding on the "Mengkirai" tree, and then proceeded on to the Para rubber. About 10 acres of young and newly planted Para were stripped of all their leaves and young shoots: notwithstanding this about 50% of the trees have recovered and a still larger proportion would have done so probably, if it had not been for the prolonged drought.

It should be stated that Para is growing here under conditions which do not obtain on the ordinary estate. The object of the plantation is to grow timber, and Para is interplanted with the young Chengal and Merbau, partly for shade but chiefly in order to obtain some return from the plantation during the first 10 or 15 years of its existence, and before the timber can be of any value.

This, though, the jungle was originally felled and burnt, yet only the lines of trees, which are 15 feet apart are kept clean for about 3 feet in width. The "Bluker" in between is allowed to grow up and is felled twice a year. Thus the mengkirai, which is ordinarily the first stage of bluker, was growing up together with the Para. Three methods were adopted in dealing with the pest, (*a*) spraying with Paris green, (*b*) Hand picking, (*c*) felling all the bluker. The first which was quite successful preserved all the trees sprayed. It was only applied to a belt of trees cutting off the affected area from the rest of the plantation and effected this also.

The second was abandoned after a couple of days, as it seemde to effect no diminution in the numbers.

The third was tried after the second had failed as it was found that the caterpillars hid themselves as soon as the sun was up.

The felling of the bluker took away what little shade there was and in 3 days all the caterpillar had disappeared.

It might be argued that in adopting the latter course Government no doubt preserved their own trees, but at the same time let loose millions of caterpillar to breed and attack Para trees in some other district.

The caterpillar, however, appears to be quite a common one. It always attacks "Mengkirai" during drought and I saw about 20 acres of bluker stripped by it about 3 miles away from Pondok Tanjong; whence these caterpillars probably came; and it is also known in Kuala Kangsar District.

Unfortunately the specimens which were sent to the Curator of the Museum died and so it has not been possible to identify the insect. In appearance it is black with a yellow band at the head and yellow underneath, slightly hairy, the largest about 2½ to 3 inches long. It is a most voracious feeder eating almost anything, even the sulphur on a match. From the above it will be seen that at present Para rubber planters have not much to fear from this pest, but at the same time, the occurrence destroys a rather prevalent illusion to the effect that there are no pests other than white ants which destroy Para.

It is also possible that the insect may develop a taste for rubber in the future, a possibility which our experience at Pondok Tanjong distinctly points to.

When they appeared in 1898 a smaller area was affected and the insects did not appear in such numbers and only about 20% of the trees attacked failed to recover.

REPORT ON THE ATTACK OF WHITE ANTS OR TERMITES—"TERMES GESTROI"—ON PARA RUBBER TREES,

By W. W. Bailey, Selangor.

I was extremely sorry that I was absent from Selangor when you visited Lowlands Estate as I particularly wished to consult

you on the spot about Termites (our worst enemy to Rubber) if that is the name of the creature that kills and eats away the heart of our healthiest and best Para Rubber trees. I have tried everything that I could think of such as arsenic, sulphate of copper, pheryl, tuba, kerosine oil and etc. etc., and no doubt I killed millions of them; but in almost all cases to be replaced by others. I almost gave it up in disgust for I was told by more than one Scientist that the Queen of this creature was not to be found in the mounds made by them as the ordinary big white ant is found: however I decided to put on two of my best men to dig for them with the result that each man averages ten queens per day, now besides destroying the homes of millions of immature ants and eggs such as I now send you:—

3 Queens in a bottle marked Termite Queens.
2 Combs (in box) containing eggs and young Ants.
Small Eggs in a bottle (as small as fine sugar).

It may possibly be said that they are not termites and it may be true; but one thing I am certain of and that is that they are identical with the creature that is now destroying our Rubber trees.

The mounds in which I find what I now send you are raised above the natural level of the ground from 1 to 2 feet and have no outward signs that they are inhabited, some of the mounds have been used and are now empty; but it is well to dig them all over as if it does no other good it is at least good cultivation.

When the mounds are inhabited the cells which are beautifully plastered all round the inside to make them waterproof are, as a rule, full of combs which contain thousands of immature young ones and undeveloped eggs.

In cells where I found the very small eggs like fine sugar there is no comb, but only the eggs on the bottom of the cell just like fish roe, where no doubt, the Queen has put it to be afterwards distributed into the combs by the working ants, who, no doubt, make the combs as well.

In a well inhabited mound 6 feet long by 3 feet wide, I calculate that there must be from 5 to 10 millions of eggs and newly born ants which cannot be seen properly without a strong glass; can it be possible that one Queen lays all these eggs, yet I seldom find more than one Queen in a mound, two is rare and 3 very rare.

Queens are always found alone in the cells with a few full grown fat termites coming in and out; but of course it is to be supposed that many had left from the noise of the digging. These attendants no doubt feed the fat bloated looking Queen and help her from the cell in which she has deposited enough eggs, into another one to go on with the same operation.

To all appearance the Queen cannot walk but she may be able to move slowly like a worm.

The average size of the Queen is one inch long but some are much less and a few as much as 2½ inches long. You see the Queen has 6 brown stripes across the back.

Proof that these insects are the ones that eat our Rubber.

In the first place they are the same to look at.

In the next place there were large rubber roots running right across the mounds and all the bark and some of the fresh young wood was eaten, though I saw none of the coffee roots attacked.

I feel certain that I shall almost exterminate these insects on my estates at the cost of about a man per million besides cultivating that part of the estate which needs it worst.

In digging over the mounds the men should rub the combs between their hands and so destroy the eggs and the immature ants, though I do not believe any would live without their proper cells.

SHORT REPORT ON THE AGRICULTURAL SHOW AT PENANG.

That the Agricultural Show held in Penang in July was a great success there can be no doubt as was testified alike by the Public and the Press and to this consensus of opinion I willingly concur. As regards the general usefulness and utility of such Shows I will not stop now to consider, except to mention one aspect, *viz.*, the opportunity for Planters and Experts meeting and discussing matters of such great interest as the various methods of growing and preparing crops for market, and which the actual presence of exhibits enable them to do in such a manner, as to be useful object lessons. Indeed when some regular system of holding Agricultural Shows is adopted, such as that of the Royal Agricultural Shows of England, that is to say the Show to be held each year in a different centre, it will be a matter for consideration, to inaugurate meetings at which Papers may be read followed by discussion, on the many subject which interest agriculturists. To the question that the Planters' Association is the proper body, for discussion such questions, might be urged that at Agricultural Shows, a much larger and more varied field of thought is represented, than can be found in one organization alone, and certainly in these days of keen competition, and advanced technical Education, information from any source must be welcomed.

As regards the Show itself it may be said that there were more than fifteen hundred entries divided amongst the following sections:—

Division (*A.*) Produce.
,, (*B.*) Fruits, Vegetables, Plants and Flowers.
,, (*C.*) Stock:—Horses and Ponies, Hacks, Cattle, Buffaloes, Sheep, Goats, Pigs.
,, (*D.*) Poultry and Dairy Produce.
,, (*E.*) Implements, Manufactures, etc.
,, (*F.*) Miscellaneous Native Industries.

Of these Divisions produce comprised all the Agricultural Produce of the Malay Peninsula, and some manufactured articles, such as Coco-nut oil, rum and sugar.

The best and most interesting exhibits, however, was undoubtedly the Rubber exhibited by Mr. DERRY of the Perak Government. Mr. ARDEN had a few samples, from sitiwian coagulated by various agents such as acetic acid, alcohol, etc, but as his experiments were not complete we must wait for his report for further details.

The Rambong exhibited by Mr. DERRY was a fine sample, and was quoted as being worth 3/10 per lb. in London, an exhibit full of interest by reason of its latent possibilities was that of M. CHASSERIAU who put up samples of Getah Tabon (Dichopsis Gutta) or D. oblongifolia in three states, the first, obtained from the tree trunk, the second, from the branches, and the 3rd, the most interesting of all, from the leaves. M. CHASSERIAU remarked in the course of an informal discussion, that the French Government preferred the Getah extracted from the leaves in preference to any other, a point of supreme importance to Planters. Sugar and Tapioca were well shown from Caledonia and Alma estates respectively, most of the other exhibits were of a high degree of merit; and especially fine were the nutmegs.

In Division *B.* some fine things were shown, the Palms being indisputably the finest exhibits in it. The fruit and vegetables were very fair considering the adverse weather experienced for some weeks prior to the Show. A word of praise must be given to the very excellent table of vegetables, and roses, brought by Mr. DERRY from the Perak hills. It brought vivid recollections of home, to see the Celery, parsley, tomatoes, potatoes, and such things exhibited in such excellent quality, especially fine were the Cabbages, which would have been considered good at home. The roses too, shewn in twelve distinct varieties shewed what can be done on the equator, given 4,000 feet elevation. Flowers were as one would have imagined from the weather, conspicuous by their absence. The prize table decoration, however, was a very tasteful arrangement composed chiefly of "Kinta weed" Vanda Hookeræ. It is said the exhibits in the other Division were very good, and altogether the Show was an unqualified success.

COPY OF A LETTER FROM Mr. R. DERRY, SUPERINTENDENT, GOVERNMENT PLANTATIONS.

GOVERNMENT PLANTATIONS OFFICE,
Taipeng, 24th July, 1901.

Sir,—I have the honour to forward the following report on my visit to Penang for the recent Agricultural Show.

2. I left Taipeng on July 8th and returned July 15th as previously approved.

3. Two exhibitions from the Perak Gardens were staged; one consisting of a fine lot of vegetables, oranges, limes, butter, and a small collection of roses in varieties. I believe I am right in saying that this was generally regarded a feature of the Show.

The other exhibition consisted of fine examples of Para and Rambong rubbers.

By direction of the Committee a Medal was awarded in recognition of excellence of exhibit which I should appreciate for myself if the Resident allows me to retain it.

4. July 13th visited Penang Gardens and obtained 2 boxes of various plants including six seedlings *Funtunia elastica* (Kicksia africana) Lagos rubber, an important addition to the gardens here.

I also saw Mr. CURTIS' specimens and planting of Getah Percha *Dichopsis* (Palaquium) gutta.

Some large trees were fruiting at the time of my visit and the difference in trees growing side by side, only to be seen in the fruit, was noted.

It is important to collect herbarium specimens of all varieties of *Dichopsis* for systematic classification, as otherwise in forming plantations it will not be improbable that the best variety for planting may be mistaken.

5. *Dichopsis* does not appear to be fruiting on the Larut Hills at present.

CORRESPONDENCE.

BOTANIC GARDENS,
Singapore, 6th August, 1901.

A correspondent writes :—

It is not very easy to advise you about your *Ficus elastica* trees. I can only say in a general way that you must be careful not to cut away aerial roots without due consideration, from the fact that you are reducing your area of stem for tapping purposes later. The same principle as governs tree-pruning should apply, that is where they appear to be too crowed, crooked or deformed, or growing inwards, cut away but not otherwise.

" *Ficus elastica.*—Can you give me any information *re* treatment " of these. I have trees $3\frac{1}{4}$ years old 30′ across and about 20-25′ " high; they are throwing down so many aerial roots from branches " that it is nothing else than a dense mass of small aerial roots be- " fore you can get at the stem of the tree,—should branches be cut " off close to the ground,—how far up, and should only a few aerial " roots be left for sapping purpose later on. Any information " you can give me will be much appreciated".

Some months ago considerable interest was awakened by the local Press quoting an account of the delicious flavour of the fruit of the Cherimoyer, and the question was asked would it grow in the Straits. The following correspondence settles the point :—

PERADENIYA,
13th May, 1901.

THE ACTING DIRECTOR,
BOTANIC GARDENS,
Singapore.

Dear Sir,

With reference to yours of 18th April, I enclose memo. by W. Nock. We have never succeeded with Cherimoyer in Ceylon below 3,000′. If we should be sending a case, the plants shall be enclosed. Otherwise you will be able to get seed from Hakgala later in the year.

Yours faithfully,
JOHN C. WILLIS,
Director.

The Cherimoyer is never likely to do in a hot place like Singapore, but if it is planted in good soil on the hills at an elevation of from 3,000 to 5,000 ft., where the temperature gives an average of about 65 to 75 degrees and the rainfall is from 80 to 100 or more inches, I believe it would thrive and fruit well.

We have no seeds now and are not likely to have any until towards the end of the year. I will, however, have a few plants put in pots and if you will let me know when you are sending Mr. Fox a wardian case of plants I will send the Cherimoyer plants down to be included in it.

W. NOCK,
Superintendent, Hakgala Gardens.

29th April, 1901.

MARKET AND TRADE REPORTS.

The following Returns have been kindly supplied by Messrs. A. A. Gunn & Co.:—

August, 1901.

	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	10	25.50	25.50
Bali	63	19.50	19.00
Liberian	148	17.50	17.00
Copra	2,273	8.50	7.50
Gambier	1,973	10.70	10.22½
Cube Gambier, 1 & 2	145	15.25	12.75
Gutta Percha, 1st quality	No quantities are reported to us.	600.00	475.00
Medium		450.00	300.00
Lower		200.00	50.00
Borneo Rubber, 1st, 2nd, 3rd		128.00	80.00
Gutta Jelotong		7.50	7.00
Nutmegs, No. 1		51.50	50.00
No. 2		67.00	66.00
Mace, Banda		83.00	80.00
Amboyna		68.00	66.00
Pepper, Black	261	29.50	28.90
White	346	45.00	43.50
Pearl Sago, Fair	85	4.40	3.92½
Medium	No quantities are reported to us.	5.00	4.40
Large		6.00	5.25
Sago Flour, No. 1	3,090	3.32½	2.95
No. 2	295	2.95	1.50
Flake Tapioca, Small	653	8.75	5.25
Medium	28	7.00	5.75
Pearl Tapioca, Small	525	7.25	5.30
Medium	778	7.87½	5.25
Bullet	...	7.25	6.00
Tin	2,255	69.12½	66.25

London Markets.

Taken from the Chemist and Druggist—for August 24, 1901.

Arrowroot.—Very dull, at auction on Wednesday all the parcel of St. Vincents offered were bought in, fine at 4*d.*, good at 2¼*d.* and fair at 1¾*d.* per lb.

Camphor.—The exports from Hiogo and Osaka during 1900 amounted to 4,262,785 lbs. (305,499) against 3,597,920 lbs. (178,280) in 1899.

Cinchona.—Although small supplies were catalogued for auction on Tuesday, only a languid interest was shown in them, owing to the heavy auctions at Amsterdam next week. Importers, however, were anxious to meet the market, and the average unit declined to $1\frac{1}{2}d.$ against $1\frac{3}{4}d.$ paid at the last London auctions.

The following table shows the quantity of bark offered and sold :—

	Packages offered.	Packages sold.
South American Cinchona - -	940	910
East Indian Cinchona - -	336	288
Java Cinchona - - -	236	44
Ceylon Cinchona - - -	228	155
	1,740	1,397

The following were the approximate quantities of bark purchased the principal buyers :—

Agents for the American factories - -	59,332 lbs.
Agents for the Brunswick factory - -	28,933 „
Messrs. Howards & Sons - - -	26,770 „
Agents for the Imperial factory - - -	26,179 „
Agents for the Mannheim and Amsterdam factories - - - - -	9,27[illegible] „
Agents for the Paris factory - - -	9,046 „
Agents for the Frankfort and Stuttgart factories	8,660 „
Druggists, &c. - - - - -	29,603 „
Total quantity sold -	197,793 „
Bought in or withdrawn -	74,584 „
Total quantity offered -	272,377 „

The prices paid were as follows :—

South American.—About 900 bales Bolivian cultivated Calisaya quill offered and sold at from $6\frac{1}{2}d.$ to $10\frac{7}{8}d.$ and broken quill at from $7\frac{1}{8}d.$ to $8\frac{1}{2}d.$, 7 bales of flat cultivated Calisaya sold at $1s.$ $3\frac{1}{2}d.$ for sound.

Java.—Ledgeriana chips, $6d.$ per lb.

Ceylon.—Ledgeriana original stem-chips, $5\frac{5}{8}d.$, branch $2\frac{1}{8}d.$, hybrid original stem chips and shavings, $3\frac{3}{4}d.$ to $4\frac{1}{8}d.$, red original stem, $3\frac{5}{8}d.$ per lb.

East Indian.—Ledgeriana stem chips, $2d.$ to $5\frac{1}{2}d.$, branch $4\frac{3}{4}d.$ and root $3d.$ to $7d.$ Succirubra, original stem, $1\frac{3}{4}d.$ to $3\frac{5}{8}d.$, branch, $2d.$ and root, $2\frac{1}{4}d.$ to $3\frac{1}{8}d.$ Officinalis, stem chips and shavings, $2\frac{1}{2}d.$ to $5\frac{5}{8}d.$, branch, $3\frac{1}{4}d.$ to $5\frac{5}{8}d.$, renewed chips, $3\frac{1}{4}d.$ to $9\frac{1}{8}d.$ and root, $8\frac{1}{2}d.$ per lb.

To the Amsterdam auctions to be held on August 29, 1,629 bales and 46 cases Java bark, totalling 139,864 kilos. have been added, so that the total amount to be offered is now 7,740

bales, 293 cases, weighing 707,644 kilos. The manufacturing bark contains an average of 568 per cent. quinine sulphate, against 5·91 per cent. for the July auction, and an average of 5·26 per cent. for the ten auctions held in 1900. The bark contains 37,192 kilos. (1,300,000 ozs.) of quinine sulphate. The stock in first hands at Amsterdam on August 14, consisted of 2,173 packages Government and 10,170 packages private bark, including the quantity to be offered at auction.

Cocaine.—A good business has been in progress lately, and makers are in some instances unable to give prompt delivery. The exports of crude cocaine from Peru during 1900 amounted to 16,479 lbs., valued at $563,625. Of this quantity the United States received 1,016 lbs. direct.

Cocoa-Butter.—The auction to be held at Amsterdam on September 3, will consist of 60 tons Van Houtens's, 1 ton Helm, 4 tons De Jong and 5 tons Mignon brand.

Cubebs.—Fair berries are obtainable at 47*s*. 6d. per cwt., which is easier.

Ipecacuanha.—Business has been done in Cartagena root at 5*s*. per lb.

Oil, Castor.—The market is quiet but steady, Hull make for prompt delivery being quoted £29 per ton for firsts and £28 for seconds, ex wharf, London. For Belgian £30 has been paid for first-pressings spot, and September-December delivery is quoted £27 to £27 10*s*. f.o.b., Antwerp for seconds.

Oil, Citronella.—For August-October shipment ten lots have sold at 8½*d*. per lb., c. i. f. in drums.

Oil, Lemongrass.—For the small supplies obtainable on the spot 6*d*. per oz. is wanted, and to arrive there are sellers at 4⅝*d*. to 4½*d*.

Opium.—Very firm. Business has been done in Persian Opium up to 11*s*. 6*d*. per lb. spot, and some holders are inclined to be firmer, asking 12*s*. For forward delivery there are no seller and the market is apparently closed for the time being. Good Smyrna druggists' (10 per cent. to 11 per cent.) has been sold at 9*s*. per lb. Soft shipping is now very scarce on this market, 15*s*. being asked for it.

Smyrna, August 9.—Owing to a slight decline on our market this week some 45 cases having changed hands as follows:—2 cases new Boghaditz selected at 9*s*. 9*d*. per lb. f.o.b., 19 cases old Karahissar talequale at 8*s*, 10*d*. per lb. f.o.b., 2 cases old Karahissar selected at 9*s*. 5*d*. per lb. f.o.b., 3 cases old current talequale at 8*s*. 6*d*. per lb. f.o.b., 20 cases new current talequale at 8*s*. 4*d*. per lb. f.o.b. Our market, however, is firm, as most of the holders refuse to sell at above prices, and the next buyers may have to pay higher to secure stuff, unless our weak and needy dealers are obliged again to sell at a sacrifice. The arrivals to date are 1,374 cases against 2,235 cases.

Spices.—There is only a small trade passing, and quotations are unaltered. At auction on Wednesday, Cochin Ginger was bought in at 65*s.* per cwt. for medium and small native-cut, at 50*s.* for small cut, and at 38*s.* for Calicut brown rough, a few bags of slightly mouldy selling at 36*s.* 6*d.* per cwt.

Jamaica mostly sold, with fair competition, at full prices to 1*s.* per cwt. dearer, common to ordinary at 37*s.* to 42*s.*, middling to fair, 42*s.* 6*d.* to 45*s.*, and dull bold at 45*s.* to 46*s.* per cwt. Zanzibar Cloves are steady at $3\frac{7}{8}d.$ per lb. on the spot, and at $3\frac{3}{4}d.$ for future delivery. Black Pepper remains quiet, with trade orders for Singapore at 6*d.* per lb., but there is very little doing for speculation, only a few transactions being reported at 6*d.* to $6\frac{1}{16}d.$ per lb. for near and distant shipment. Singapore White is quoted 9*d.* per lb. and Penang $8\frac{9}{16}d.$ per lb. The quarterly auction of Cinnamon will take place on Monday next.

Vanilla.—Although only a small supply offered at auction, the demand was poor, and only part sold, at about 1*s.* decline, as follows:—Seychelles, 7 to 8 inches 15*s.* to 18*s.*, 3 to 7 inches 11*s.* to 15*s.* 6*d.*, and common splits 3*s.* 6*d.* to 10*s.* 6*d.* per lb. Mauritius, good 7½ to 8½ inches 20*s.*, 6½ to 7 inches 18*s.* 6*d.* to 19*s.*; 6 to 6½ inches, 15*s.* to 17*s.* 6*d.* and common splits 10*s.* to 15*s.* 6*d.* Bourbon, fair 5½ to 7 inches 15*s.* to 15*s.* 6*d.* The export of Vanilla from Mexico decreased considerably both in quantity and value during 1900, as the frosts and rains in the early part of the year and the want of the latter at the proper season spoilt the plants, and the crop was subsequently lost. The quantity exported was 60,921 lbs. as against 133,676 lbs. in 1899, and the values were respectively £62,565 and £181,547. Vanilla is now receiving the attention of many of the American Agricultural Companies whose properties are in the State of Vera Cruz, and it is quite probable that the exports during 1901 will, under normal conditions, be greater than in 1900.

The weather for August.

August has been a dry month in Singapore and the Federated Malay States. Malacca alone slightly exceeded the monthly average; 11.58., having been registered at the General Hospital. The least amount fell at Klang, the month's fall there being only 1.77. Appended is the Abstract of the Readings taken at the different Stations.

Singapore.

Abstract of Meteorological Readings for August, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29.884	140.2	80.8	86.9	74.7	12.2	77.4	.869	75.0	77	SE. SSE.	4.47	1.21

K. K. Hospital Observatory,
Singapore, 19th September, 1901

A. B. LEICESTER.

Penang.

Abstract of Meteorological Readings for August, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	F°	F°	F°	F°	F°	F°	ins.	F°	1%	South.	ins.	ins.
	29.866.	150.2	80.1	90.1	73.4	16.7	75.5	761	72.3	82	S. E.	11.01	1.56

G. D. FREER,

Colonial Surgeon, Penang.

Penang, August, 1901.

Malacca.

Abstract of Meteorological Readings for August, 1901.

	Mean Barometer Pressure at 30° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall in 24 hours.
			Mean Dry Bulk.	Maximum.	Minimum.	Range.	Mean Wet Bulk.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital.	29.852 inches.	146.9	82.4	87.2	68.	19.3	81.	1.041	51.2	93%	S.	11.58 inches.	2.78 inches.

Malacca, September, 1901.

F. B. CROUCHER,
Colonial Surgeon.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for August, 1901.

District.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	157.2	83.66	93.20	70.50	22.70	76.91	837	73	6.76	2.93
Kuala Kangsar ...	...	81.25	93.	70.	23.	76.10	832	78	3.89	1.69
Batu Gajah ...	158.	82.44	94.	71.	23.	77.45	877	79	4.59	1.05
Gopeng ...	...	81.72	93.	66.	27.	76.09	824	77	5.64	1.78
Ipoh ...	...	81.71	93.	71.	22.	76.72	855	79	5.73	1.59
Kampar ...	...	...	93.	70.	23.	...	...	...	1.90	.65
Telok Anson ...	...	82.52	92.	70.	22.	77.05	855	77	5.69	2 00
Tapah ...	..	82.10	94.	69.	25.	76.34	830	76	2.92	1.11
Parit Buntar ...	...	82.47	92.	72.	20.	77.62	875	80	6.38	1.80
Bagan Serai ...	...	81.98	91.	71.	20.	77.36	874	81	6.28	2.64
Selama ...	...	81.64	90.	70.	20.	76.21	862	77	7.69	2.35

Taiping, 10th September, 1901.

S. C. E. FOX,
Acting State Surgeon, Perak.

Selangor.

A bstract of Meteorological Readings in the various Districts of the State for August, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29.902	149.0	80.4	90.3	71.6	18.7	76.6	0.843	74.4	80	Calm	4.58	1.45
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	5.05	1.35
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	4.21	0.80
,, Klang	...	...	...	88.0	76.7	11.3	...	...	...	...	...	1.77	0.55
,, Kuala Langat	..	...	...	85.5	73.1	12.3	...	...	...	...	...	3.87	1.50
,, Kajang	...	...	...	86.7	75.0	11.7	...	...	...	...	...	3.67	1.92
,, Kuala Selangor	...	...	...	87.2	77.4	9.8	...	...	...	...	...	2.66	1.53
,, Kuala Kubu	...	...	...	91.9	72.0	19.9	...	...	...	...	...	10.59	3.09
,, Serendah	...	...	...	90.0	75.2	14.8	...	...	...	...	...	3.80	1.15
,, Rawang	...	...	...	86.7	73.7	13.0	...	...	...	...	...	3.04	0.72
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	7.39	2.60

State Surgeon's Office,
Kuala Lumpur, 10th September, 1901.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for August, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maxium in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Temerloh - -	...	...	...	92.	70.	22.	...	...	...	...	...	5.15	
Pekan (Hospital) -	...	...	...	92.5	71.	20.	...	...	...	...	...	5.20	1.30
Kuantan - -	...	...	...	86.	71.	15.	...	...	...	...	...	5.81	0.98
Kuala Lipis - -	...	...	...	93.5	70.	23.5	...	...	...	...	...	7.49	1.52
Raub Hospital - -	...	...	...	94.	69.	25.	...	...	...	...	...	5.69	1.88
Bentong Hospital -	...	...	...	94.	64.5	29.5	...	...	...	...	...	3.03	1.02

STATE SURGEON'S OFFICE,
Kuala Lipis, 1901.

Signed E. F. Townley, D. O.
D. H. M. McClosky, } *Actg. Residency Surgeons.*
J. D. Gimlette,

No. 2.] NOVEMBER, 1901. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

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AGRICULTURAL BULLETIN
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No. 2.] NOVEMBER, 1901. [Vol. I.

THE TIMBERS OF THE MALAY PENINSULA.

Continued.

Guttiferæ.

This order is well represented here and contains a considerable number of important timber trees. There are four genera in the Peninsula, *viz.*, Garcinia, Calophyllum, Kayea and Mesua.

Garcinia.

There are upwards of forty species of this genus here, trees rarely of any great size, but many attain a height of from forty to sixty feet. Several produce eatable fruits such as the Mangosteen. (*G. mangostana*), Asam Gelugur (*G. atroviridis*), Mundu (*E. dulcis*) and Kandis (*G. nigrolineata*). Nearly all the species produce from the bark, when wounded, a quantity of the yellow gum known as *Gambnge*, but in many cases it is scanty in quantity, or only partially soluble in water, and often becomes of a dull colour after drying. Commercial Gamboge is produced by the Siamese (*G. morella*).

It is imported into Singapore and exported thence to Europe. Gamboge is used as a dye, and as a purgative in medicine.

Some of our wild Garcinias are rich in quantity of Gamboge such as *G. nigrolineata* and it is possible that it might be worth collecting.

G. Mangostana, Mangosteen, Manggis.

Is usually a short stunted tree but it sometimes grows to a height of forty feet. The wood is dark brown, rather hard and heavy, with conspicuous rings $\frac{1}{4}$ inch apart, pores large in undulating lines, and the rays very fine and close.

Though small this is a fairly good wood for many purposes. Pierre says that the wood is much valued for cabinet work, and oars. Van Eeden states it is used for building, rice pounders, spear-handles, etc.

Weight $61\frac{5}{7}$ lbs.

G. Nigrolineata, Planch, Kandis.

A tall but not very thick tree with flaky brown bark, small stiff

leaves, and small yellow flowers, fruit yellow as big as an olive or larger eatable.

The wood is yellowish becoming brown, with distinct irregular rings and large pores. It is durable if not exposed but is liable to the attacks of insects.

The rays are rather distant and connected by transverse bars as in *G. nervosa*, (Miq.) Maingay says it is used for house supports, but that it splits very much in drying and gives the weight as 63 lbs. 11¾ ozs., a Singapore specimen weighs 33 lbs. 3 ozs.

G. Merguensis, Pierre.

A small tree not very common here.

Wood reddish yellow, flexible and light, not much used (Pierre).

G. Forbesii, King.

A small to medium tree. Wood heavy brown, splitting readily, rings distinct, rays rather distant, pores medium to large, concentric lines as short transverse light coloured bars.

G. nervosa, Miq., Kandis Gajah.

A tall tree about 40 to 60 feet tall, with rather smooth bark, exuding much gamboge when cut. Leaves large with strong nerves, and fruit like a yellow or russet apple, very acid.

The wood is fairly heavy light brown rather soft, pores few and large, rays distant rather broad, whitish in colour, with transverse wavy bars connecting them. Weight 50 lbs.

G. malaccensis, Hook fil., Manggis Hutan.

A rare tree only collected by Maingay. "Wood reddish white with darker lines and blotches, grain medium fairly hard, splits in drying. Used for ordinary work. Weight 43 lbs. 7 ozs." (Maingay).

G. dulcis, Kurz. Mundu.

A fruit tree with egg-shaped yellow fruits often cultivated. The wood is good and sought for building and furniture in Java according to Van Eeden.

Calophyllum, Bintangor.

About 20 species of this genus occur here. All, but one or two bushes, are trees from 30 to 100 feet tall. They are recognized by their opposite coriaceous leaves very closely veined with innumerable small veins closely parallel to each other. The flowers are in axillary and terminal panicles, white and usually showy. The fruit is a globose green drupe with a rather hard stone. The trees contain in the bark and fruit a brownish gum often becoming black on exposure. The timber is usually red and much used for masts, ship-building, poles, but seldom for planking.

C. inophyllum, L. Penaga, Pudik.

A tree of no very great height, usually branching rather low down. It attains a height of 20 or 30 feet and a diameter of trunk of 2 feet. The leaves are about 4 inches long elliptic, dark shining

green. Flowers in racemes white showy. Fruit a green globose drupe.

The wood is rather variable, the rings are usually large and distant, pores small and moderate sized arranged in groups. It is hard, close grained and smooth, light red.

Weight 63 lbs. (Kurz.), 42 lbs. (Gamble), Singapore 45 lbs. 12 ozs. Used for stern posts, ribs and other parts of ships, for which it is in considerable demand. Also for carved work, barrels, furniture, etc., machinery, railway sleepers.

The tree usually grows near the sea, and is very common on sandy coasts. It is often cultivated for its flowers or as an ornamental tree. It, however, does not, as a rule, grow well in land. It is readily grown from seed, and grows fast, and might well be planted in sandy ground near the sea, as it is much in request for boat building.

When wounded the tree produces a black gum of little value. It is one of the gums collected by the Kelulut (*Trigona*) to make its nest (*see* under Damar). The seeds which are produced in large quantities, are used by native children as marbles, and in India produce an oil known as Pun or Domba oil of a greenish or yellowish colour, used for lamps, caulking boats and as medicine for rheumatism. The seeds are broken with a small hammer, the kernels sliced and dried in the sun and then crushed in an oil mill. The oil does not appear to be used here.

C. inophylloide, King.

A tall straight tree 60 to 80 feet tall with grey rimose bark with much black resin on being cut. The wood resembles that of Penaga but is rather more close grained and heavier, reddish. Weight 35 ℔s. 7 ozs.

C. pulcherrimum, Wall, Bintangor Batu, Bintangor Bukit.

A tall straight tree attaining a height of 60 feet, leaves small obovate, dark green, young shoots red. Flowers numerous small white.

The timber is lighter coloured than that of Penaga, and less open in structure, the rings often broken and irregular.

Common in the South of the Peninsula in dense jungle. This is one of the trees which when cut young is used as "Bintangor rollers" for house building, fishing stakes, etc. It grows fairly fast from seed, which is produced in great abundance, and is a good tree to plant for poles and such like work.

C. canum, Hook fil. Bintangor Bunga.

A fairly tall tree not very common. Wood brownish white streaked and variously marked with brown, grain very coarse, soft and does not split in drying. Used for masts. Weight 31 ℔s. 3¾ ozs. (Maingay).

C. spectabile, Willd., Bintangor Bunut.

This is also a tall straight tree similar in appearance to the *C. pulcherrimum,* but the leaves are long and oblong in form with a rusty fur on the buds, young leaves purplish blue.

Its timber resembles that of the last but the pores are rather larger and the rings distinct, narrow and pale.

It is good for masts as well as stakes, house poles, etc., and is considered one of the best of the Bintangors.

C. macrocarpum, Hook fil., Bintangor Rimbah.

A tall tree with narrowly oblong leaves.

The timber resembles generally that of the last but it is more buff-coloured than red, and has smaller pores. Weight 11 lbs. 9 ozs.

C. Wallichianum, Planch. Bintangor Hati Yu.

A big tree, the twigs buds and young leaves covered with reddish tomentum.

Timber reddish resembles the others but the pores are fewer and the rings rather wide.

Kayea.

A small genus of trees, some of which attain a height of 60 feet, but most are quite small and in most the trunks are gnarled and irregular.

K. grandis, King. Bunuai.

Attains a height of 80 feet.

It is used in house building, but is a rather rare tree.

Mesua.

Of this genus we have two species *M. lepidota*, King, a very little known tree, and *M. ferrea*, L., a beautiful tree commonly known as Ceylon ironwood, and as Matopus, Penaga Bunga, Penaga Putih, Suga, Lilin, by the Malays. It occurs in many parts of the Malay Peninsula, Penang, Perak, and is cultivated as an ornamental plant, growing readily from seed. It is not, as a rule, a very big tree, but attains a height of 70 or 80 feet. The bark is smooth and grey about $\frac{1}{4}$ inch thick, with oblong flakes. The leaves are narrow, deep green above grey beneath, when young bright red, the flowers very large, white with innumerable yellow stamens, very sweetly scented.

The sapwood is fairly large about $1\frac{1}{2}$ inch thick in a medium sized tree, pale whitish brown to dark brown. Heartwood deep brown or dark red extremely hard, tough and springy, pores rather large in irregular lines and also scattered, rays exceedingly fine and close, concentric lines conspicuous wavy and broken up.

Weight 71 ℔s. 13 ozs. (Maingay), 69 ℔s. to 76 ℔s. (Gamble), (S.) 75 ℔s. 4 ozs., very durable and strong but hard to work.

It is used for rice pounders, (Maingay) tool handles, gun stocks, bridges, boats, buildings, etc. in India, and has been found to answer for sleepers very well, but its great hardness, weight and the difficulty of working it are against its general use (Gamble). Beams 5 or 6 inches square can be had at times.

Ternstroemiaceæ.

Shrubs and trees of no very great size, but with fairly hard timber often large enough for building.

Adinandra dumosa, Jack, Tiup-tiup, Medang Petutu.

A small tree sometimes attaining a fairly large size, about 30 feet tall, usually much branched, diameter about a foot. Bark ¼ inch thick, wood red when fresh turning brown, fairly hard and heavy, is apt to split in drying, rays irregular fairly thick and thin, mixed pores fairly large not very numerous often divided, surrounded by a small amount of softer lighter tissue, uniformly scattered. In some specimens the pores are much more numerous and crowded. Weight 39 lbs. 9 ozs. (Maingay.), (S.) 42 lbs. 2 ozs. to 48 lbs.

The wood is as a rule not large enough to be of great value but is used for house building and firewood. The tree is very common in secondary jungle springing up readily. It survives grass fires, and will grow through lalang, soon forming small woods.

A. acuminata, Korth.

A medium sized but rather slender tree. Wood heavy and hard of an olive yellow-colour browner in the centre, rays fine numerous pores rather large surrounded by a little softer tissue arranged in groups. Weight 57 lbs. 8 ozs.

A. Miquelii, King. Kwak.

A medium sized tree in sandy spots by mangrove swamps and woods. The fruit of this tree shows that it should really be classed under *Ternstroemia,* as Miquel put it under the name of *Ternstroemia bancana.* Wood rather light, reddish brown, rings faintly marked, rays irregular rather thick, pores very numerous, small, crowded, but uniformly distributed. Weight 35 lbs. 4 ozs.

Saurauja.

Small trees with flowers pink or white on the branches or old wood. Usually rather irregular gnarled trees with soft poor wood.

S. cauliflora, Dc.

Rather a scarce tree, occurs in Selangor and Perak.

Has a soft white light wood, becoming brownish, rings inconspicuous, rays fine. Weight 18 lbs. 13 ozs.

Schima Noronhae. Reinw. Medang Bekwoi.

A tree 40 to 80 feet high.

Timber very close-grained, dark red, rays very fine and obscure not close, pores exceedingly numerous very small, containing a resinous substance. The wood is heavy and hard, shining, is apt to split, but is a good useful wood.

Weight 45 lbs. (Gamble). Penang 50 lbs. 5 ozs.

Hill districts, Penang, Perak.

Gordonia excelsa, Bl. Pagar Anak Jantan.

A fairly large tree, with large white flowers, stem tall and straight.

Wood pale red, fine to medium grain, good for houses, beams and boats. Weight 59 lbs. 5¾ ozs. and 65 lbs. 7½ ozs. (Maingay).

Eurya acuminata, Dec. Malukut Jantan.

A small tree common in most parts of the Peninsula.

Wood pale red, grain fine hard, splits slightly in drying. Used for beams in house building. Weight 57 lbs. 10 ozs. (Maingay), 47 lbs. (Gamble).

It is used for charcoal in Java (Van Eeden).

Pyrenaria acuminata, Planch.

A small tree not rare in woods. Wood light and soft, pale reddish brown with rather large rays and very small scattered pores. Useful for poles and rafters. Weight 37 lbs. 5 ozs.

Archytea Vahlii, Choisy. Riang-riang.

A small tree common in open country. Wood rather heavy, hard brown with a red centre (very pale whitish red becoming darker towards the centre (Maingay), rings broad distinct, rays fine irregularly scattered, pores fairly large numerous in irregular lines. Weight 81 lbs. 15 ozs. (Maingay) 50 lbs. 10 ozs. Good for poles, rafters, etc.

Malvaceæ.

Eleven genera of trees and shrubs, of which the smaller ones Sida, Abutilon, Urena and Hibiscus produce good fibres from the bark, though it may be doubted whether they could be grown remuneratively. Bombax and Eriodendron, (cotton trees) produce a silky fibre on their seeds known as silk cotton, Kapok. That of Eriodendron is the most valuable and the tree is commonly cultivated for the fibre or cotton round the seed especially in Java as there is a good demand for it.

Most of the timbers of the trees of this order are soft and useless.

Eriodendron anfractuosum, Dec. Kapok, Kabok.

Has soft white wood of a loose texture with large pores. It is grown along the road sides in Java for telegraph poles.

Durio zibethinus, L. The Durian.

Has brownish white wood with large pores somewhat scattered and obscure rings. Weight 40 lbs. 4 ozs.

D. Oxleyanus, Griff. Kuripal.

A gigantic tree resembles this but is closer in texture. Weight 47 lbs. 2 ozs.

Coelostegia Griffithii, Mast. Pungai.

Is a very large tree with grey bark and strong buttresses. It may be recognized by its fruit which resembles that of a durian but is hard and woody with conical spines, black outside when fresh, and bright orange within. Weight 44 lbs. 9 ozs.

The bark is used for tanning nets. The wood is orange when fresh cut, becoming darker, of a reddish colour, and somewhat resembles Seraya, with large pores.

It is hard, flexible and durable.

Boschia Griffithii, Masters. Daun Durian, Dendurian

Is a smaller tree, attaining a height of about 60 feet with a diameter of 2 or 2½ feet.

The heartwood resembles that of Pungai, hard and fairly durable. It is used for house building, and beams 5 or 6 inches square can be had, which it is said will last five years if exposed. Maingay describes it as pale brownish white, with darker striæ and blotches or pale red with paler streaks, soft to medium hard, splits slightly in drying, and used for boat building and general work, only lasting 7 or 8 years.

Weight 34 lbs. 8 ozs. to 51 lbs. 15 ozs.; Singapore 21 lbs. 15 ozs. to 27 lbs. 13 ozs..

Thespesia populnea, Corr. Baru (Waru) Laut.

Is a tree of no great size, often rather short and gnarled, which grows commonly near the sea. Its poplar like leaves and large yellow flowers with a maroon centre make it easily distinguishable. The bark is grey about ⅛ inch thick. The sapwood is white, the heartwood red brown or red fairly large, rings usually conspicuous, rays fine and numerous pores of moderate size.

It is used in boat-building for carts, gunstocks, etc. Weight 49 to 53 lbs. (Gamble), Singapore 37 lbs. 10 ozs. to 54 lbs. 13 ozs.

Hibiscus tiliaceus, L. Baru-baru.

Is a somewhat similar tree with softer downy leaves. The wood is white the heartwood yellowish, fine grained with rather larger pores. It is inferior to the preceding but sometimes used in the same way. Gamble says not used except as fuel. Weight 35 lbs. to 30 lbs. (Gamble) Singapore 54 lbs.

These two trees and the allied *Hibiscus floccosus*, produce a strong fibre from the bark which is used for ropes, etc.

Sterculiaceæ.

These are mostly trees sometimes of vast size but many are small, a few give useful timbers but several groups have very inferior woods.

Sterculia.

Medium or small tree, easily known for the most part by their scarlet capsules spreading in the form of a star with black seeds hanging from the edges.

S. rubiginosa, Vent. Kulunting.

A common small tree about twenty feet tall and 6 or 8 inches through. Wood rather soft light brown, rays broad and reddish, pores large. A poor class of wood.

Floats in water, not durable, used in house building.

S. parviflora, Roxb. *S. Maingayi*, Mast. Parupo.

A much bigger tree about 60 feet tall.

Wood "reddish white externally, darker internally, grain coarse soft, does not split in drying. Weight 41 lbs. 14 ozs." (Maingay). A very poor soft wood.

S. sp. from Langkawi islands, a small tree producing the flowers after the fall of the leaf; has a light brown or yellowish red wood, much resembling that of *Heritiera,* fine grained with small pores.

S. Scaphigera, Wall. Kembang Samangko.

A vast tree 100 feet tall with a straight smooth stem, distinguished by its seeds which are borne in a large thin green boat shaped capsule and when put in water produce a quantity of mucilage containing Bassorin, a favorite medicine with natives. The timber is white and soft outside, harder and darker within, light floating in water, used for planking. Weight 31 lbs. 11 ozs.

S. campanulata, Wall. Kluet, Kulunot.

A tree of 80 to 90 feet, Forests, Perak. Timber whitish brown not durable.

Pterospermum Blumeanum, A "Bayur".

A tree about 50 feet tall common in all the lower jungles. Wood soft white corky with a few large pores very poor. Used for planking.

Pdiversifolium. Bl.

A gigantic tree with large buttresses common. Wood "orange yellow, grain medium, fairly hard, splits slightly, used for boxes. Weight 50 lbs. 9½ ozs." Maingay.

Commersonia platyphylla, Andr. Durian Tupai.

A common tree of no great size abundant in secondary jungle, with cymes of white flowers. Wood light, pale brown, moderately hard, rays broad, wavy pores rather large, mottled in longitudinal section with the darker coloured rays. Weight 29 lbs. 6 ozs.

Tarrietia simplicifolia, Mast. "Teraling", Merbaju,Siku Keluang.

An enormous tree with strong buttresses and rough bark.

"Wood very pale red becoming darker towards the centre, grain medium fairly hard, splits in drying. Largely used for cart wheels. Weight 52 lbs. 7¼ ozs." (Maingay).

A specimen from Singapore is very heavy and fairly hard, dark red, the pores large and often divided, the rays irregular rather distant and fairly broad red, wood fibre grey. A handsome and excellent wood.

Buttneria uncinata, Mast. "Sugi Jantan".

Wood dull red paler in some parts than others, grain coarse hard, does not split in drying. Used for the sides of gharries. Weight 60 lbs. 4 ozs." (Maingay).

This plant has only been collected by Maingay in Malacca. All the other species are climbers of no great thickness and of no use.

Heritiera, Dungun.

There are here three species of this genus recognized by the coriaceous leaves with silvery backs, and woody ovoid fruits with large keels. Two species occur in mangrove swamps and one much larger occurs in forests.

H. littoralis, Dryand.

A medium sized but rather irregularly shaped tree, growing in tidal swamps. The wood is dark brown and heavy, finely grained, with large scattered pores, the rays are often conspicuous especially in young wood.

A useful wood for house building, piles and boats, rice pounders, blocks, etc. It is extremely tough and durable.

Weight 53 lbs. to 70 lbs. (Gamble) Singapore 76 lbs. 15 ozs.

H. sp. Dungun bukit.

A very large tree growing in dense forest far from the sea, about 80 feet or more tall.

A very fine hard close grained wood, dark brown in colour, pores numerous fairly large. Weight 55 lbs. 3 ozs.

Tiliaceæ

Are represented here by seven genera of trees and shrubs, of which two Triumfetta and Corchorus, are under shrubs giving a strong fibre, *Corchorus Capsularis* and *C. olitorius,* being Jute-plants.

Pentace

Includes ten species of big trees, of which the commonest is *P. triptera*, Mast "Medang Serai", "Kabal Ayam", "Sepa Petri". It attains a height of 80 or 90 feet.

The bark is grey, flexible and strong and used for the walls of houses. The wood is hard and dark reddish brown in colour, close grained with fairly conspicuous rings, small rays and small pores. Weight 31 lbs. Singapore, Malacca, Perak.

Schoutenia Mastersi, King, Kooudoo (Maingay).

Wood faint reddish white, grain very coarse, very soft does not split in drying. Weight 25 lbs. 4¾ oz. (Maingay).

Elæocarpus.

There are a number of trees of this genus, none of which attain any great size, but many grow big enough for rafters, posts, and the like, the bigger ones are about 60 feet tall and a foot through. The flowers in racemes are white and often showy, fruits globose or olive shaped, oily blue or green. Most are common in woods in the low country.

E. stipularis, Bl. Medong Tijo.

A very common tree about 50 feet tall or less.

Wood moderately light reddish brown, rather soft, pores large, often sub-divided, rays obscure fairly broad. It is apt to split and is not durable, but is used for beams in houses, rafters, &c. Also for boxes (Maingay). Beams 5 or 6 inches square can be obtained.

Weight 35 lbs. 5 ozs. (Maingay). Singapore 27 lbs., 32 lbs. 10 ozs., 36 lbs.

E. petiolatus, Wall. Medang pepilakan.

A fair sized tree with large deep green shining leaves with rather thin grey or brown warty bark. Sapwood ⅓ of the thickness

of the trunk whitish or light brown. Heartwood white or dark brown rather light and soft, pores large often sub-divided, scattered, rays rather fine.

Weight 42 lbs. 12 ozs. Common.

E. robustus, Bl.

A fairly large tree.

Wood white shining soft even-grained, pores moderate-sized uniformly distributed, generally oval or elongated sub-divided, rays fine and very closely packed.

Weight 38 lbs. (Gamble).

E. Mastersi. King. Chemantong Merah.

Usually a small tree, said to attain the height of 60 feet. Wood rather hard and heavier than most species, light brown, pores fairly large and numerous, rays rather thick.

Used in building, for rafters, and for firewood, lasts about 6 or 7 years. Weight 50 lbs. 15 ozs.

E. Jackianus, Wall. Jatek Jatek, Jintek-Jintek, Saburu.

A medium sized tree with grey rather smooth, bark $\frac{1}{8}$ inch thick, and rather heavy yellowish brown wood, with but little brownish sapwood, rings distinct, rays fine, and very fine mixed pores, medium sized in pairs, arranged in rows. Weight 51 lbs. 2 ozs.

E. pedunculatus, Wall. Chumantong Jantan.

Attains a height of 60 feet, common in low country forest. Wood light red, floats in water, is used in building, for rafters, etc., but only lasts 5 or 6 years.

E. obtusus, Bl. Medong Paya, Medong Tana, Medong Kawan.

A fair sized tree common near the sea.

Wood reddish used for planking.

Grewia.

Trees or shrubs usually of no great size.

G. paniculata, Roxb. Chenderai.

A tree about 30 to 50 feet tall.

Wood heavy, hard, dark brown with very small pores and very fine wavy rays whitish in colour, giving the wood a pretty mottled appearance.

Weight 47 lbs. 2 ozs.

Common in secondary growth, Malacca, Penang, etc.

Dipterocarpeæ.

The trees of this order supply the largest number of important timbers of any group in this region including as they do such well known kinds as Serayah, Meranti, Chengei or Penak, Resak, Giam, Damar laut and Camphor wood, nor is it only in timber that this order is valuable, for from trees of this group are obtained Wood-oil, Dammar, Camphor and Camphor-oil, while the flexible bark of some species is used for walls of houses, rice chests and such things.

The plants included in this order are all trees of large often vast size, attaining sometimes a height of 200 feet, with a diameter of 6 feet. They have a bare straight stem 80 feet or so to the first branch, often buttressed at the base, but as a rule the buttresses are not so large as in many other trees. The leaves vary much in size and form but are seldom large, usually coriacious, and the leaf stalk is almost invariably thickened below the blade of the leaf, and the branchlets show especially when dry a raised line running up along one side to join the base of the leaf-stalk, (the lateral leaf trace. Brandis Enumeration of the Dipterocarpeæ. Jour. Lin. Soc.) The flowers are arranged in racemes or panicles and are recognisable by their twisted petals, pink, white or yellow, usually very sweet scented. They are largest in the genus Dipterocarpus, and quite small in Shorea and Hopea. The fruit gives the simplest and best character for distinguishing the genera and species. The fruit consists of a single seeded round nut, surrounded by the enlarged calyx. The sepals of which are usually developed into long narrow wings by the aid of which the ripe fruit is drifted away in the wind and so spread over the forests. In *Dryobalanops, Parashorea* and one section of *Vatica* all the five sepals are developed into long wings much larger than the fruit. In *Dipterocarpus, Anisoptera, Hopea, Cotylelobium,* and some Vaticas, only two are developed. In *Shorea* and *Pentacme*, three. In *Isoptera* the sepals are rounded and spreading, but shorter than the fruit. In *Balanocarpus* (Chengei) the calyx forms a cup at the base of the fruit, *Pretinodendron* and *Pachynocarpus,* have rough brown fruits without any wings.

The Dipterocarps usually grow scattered through the jungles. The Camphor tree being the only exception. This latter in the only two places in the Peninsula where it is known to occur forms forests consisting exclusively of itself. It is said by Korthals to do the same in Sumatra, but it is a most unusual method of growth in any tree in the Malay Peninsula. In Assam, Burmah and Cochin-China however, there are several Dipterocarps which habitually form forests to the exclusion of other trees notably the Sal tree (*Shorea robusta*). Dipterocarps, as a rule, only flower when they have attained a great size. *Pachynocarpus*, *Isoptera* and *Pentacme* however often flower when comparatively small trees.

Only a few of the Dipterocarps flower annually when they are old enough to flower. Many species of *Dipterocarpus* flower every year, or almost every year, as does *Pachynocarpus* and one or two others. But, as a rule, the Shoreas and Hopeas flower only once in six years, when the weather becomes very dry. This makes the propagation of these trees somewhat troublesome. As for five years out of six no seed is procurable. The seed is produced in great quantities when the trees do fruit and usually germinate readily though a very large proportion of those that first fall are barren. Indeed in some Dipterocarpi it is common to find the seed in the ovary replaced by wood-oil. The growth of the tree is very slow. But it is difficult to form any very accurate idea of the rapidity of growth as at present there are no records of planted

Dipterocarps of sufficient age to determine their growth here, and even in the case of Sal (*Shorea robusta*) cultivated in Assam, there seems to be some doubt as to the actual rate of growth of the timber. It appears however, that in this tree a girth of 54 inches represents a growth of 65 years, and 72 inches represents 95 years (Gamble's Manual of Indian Timbers). Judging by the growth of young *Shorea leprosula* this appears to be about the growth of our own species.

Nearly all of the Dipterocarps produce a timber of some value, but they vary a good deal in importance. The timbers known as Serayah and Meranti are rather soft red timbers much used for planking and furniture. They all belong to the genus Shorea, of which there are a number of species. The Serayahs have different names partly given to designate special forms of timber and partly referring to distinct trees, but the names are often irregularly used. Thus Serayah Batu is a harder and heavier wood than the other kinds. The name properly appears to belong to *Shorea leprosula*, but is in trade applied to many apparently distinct woods of a rather better quality than what is known as ordinary Serayah. Meranti is equally irregularly used, and in trade at least appears to be absolutely synonymous with the name Serayah. Chingal (not to be confounded with Chengai) is also Serayah.

The trees appear to be liable to the attacks of a fungus which destroys the heart, and renders it worthless. This generally begins from a wound on the trunk and the mycelium entering at this point grows upwards and downwards. The remains of the centre eventually is found to be in the form of a honeycomb like structure.

Dipterocarpus.

A genus of about sixty species occurring all over the Malay region, of which there are about thirteen here. They all consist of trees usually of very great size, with moderate to large leaves, fairly large flowers, usually red or cream colored, and sweetly scented. The fruit is globose or oblong, either quite smooth or furnished with five ridges or wings, and bearing on the top two very large oblong linear wings. The fruit which is usually red is much larger than that of the Serayas, (Shorea) and is distinguished by the wings arising from the top of the fruit and not being partly free from it. The wings of the fruit in all these plants are the developed sepals, and in *Shorea* these are so far free from the fruit itself that the top of the fruit can be seen projecting between them, whereas in Dipterocarpus the wings appear to stand on the top of the fruit, the tube of the calyx being adnate to it.

Some of the Dipterocarpi here flower almost annually, others only once in five or six years; but they are more often to be met with in flower than the Shoreas.

As a rule, the timber of the *Dipterocarpi* is not considered of much value, being inferior in most cases to Shorea timber. They produce however the wood-oils and have always had an economic value for this.

Dipterocarpus Grandiflorus, Blanco. *D. pterygocalyx*, Scheff.
Minyak Kruing Dadek.

A gigantic tree attaining the height of upwards of 200 feet and a diameter of 2 feet or more. Bark hard grey wrinkled with small transverse grooves, about $\frac{1}{3}$ inch thick. Leaves very large ovate elliptic with a broad base, edges crenulate, glabrous, strongly ribbed. Flowers 2 inches long pinkish cream color. Fruit red, the largest of any species oblong with five strong keels or ridges and two large oblong wings (calyx lobes) nine inches long and two inches across. The very large fruit easily distinguishes this. It is common all over the Peninsula.

The timber is hard and fairly heavy, very resinous, deep red brown and close grained, the rings fairly distinct and numerous, pores numerous and close rather large and arranged in groups and irregular bands, rays numerous very close, unequal light coloured. There is a certain amount of sapwood about $\frac{1}{3}$ of the trunk. Weight 50 lbs. 8 ozs. The wood is not considered good, as it is apt to break up, but is sometimes used in building.

The oil soon sets into a light brown resin almost completely. It is used in varnish either fresh before it sets or mixed with other oils and so redissolved.

D. crinitus, Dyer. Gombang.

This tree attains a height of about a hundred and fifty feet, and is easily recognized by its hairy branches and leaves. The leaves are ovate stiff and hard and covered with stiff yellow hairs especially along the midrib. The flowers are large, pink coloured and sweet scented. The fruit is rather small for the genus, quite smooth and not ribbed or winged.

It is common all over the Peninsula.

The timber is good and strong being suitable for bridges and house building. It is dark brown in colour with rather large pores, and fine rays not very close but rather irregularly placed, the rings are obscure. It is a fairly heavy wood.

The oil is known as Minyak Keruing Bulu. Weight 62 lbs. 2 ozs. (Maingay), S. 25 lbs. 6 ozs.

The bark is used for house building.

Shorea leprosula, Miq. Seraya Batu.
Shorea Meranti Burk.

A lofty tree over 100 feet tall, the stem straight about three feet through with thick but low buttresses. Bark grey rough longitudinally flaking. Leaves oblong with broad bases five inches long and two-and-a-half wide or smaller, light shining green, with 13 pairs of veins smooth above and rough beneath with numerous transverse nervules connecting the veins, especially conspicuous beneath where the nerves and midrib are also thickened. The petiole is short and thick about half an inch long. It is roughened with small red points visible with a lens. The whole leaf has a rough feel, due to some remarkable tufts of short hairs visible under the microscope. The flowers are small and white.

The fruit is a small globose nut with three long narrow wings linear rounded about 7 veined, and reticulated 3 inches long ½ inch wide, yellow, when ripe turning brown, the other two wings of the calyx are much smaller linear and narrow. The tree is rather liable to the attacks of insects, so much so that the results of their attacks may be often found useful in identifying young plants in the jungles.

The branches are often swollen in a fusiform manner. These when opened are found to contain curious brown chitinous angled bodies broad at the base and prolonged at the point into a long beak which terminates close to the surface. These are the eggs of an insect probably a cicada.

Underneath the leaves are often to be seen the felled galls produced by a Gallmite. The nerves and midrib are swollen for part or the whole of the length, and edged with small brown patches nearly continuous which under a lens appear honey-combed. These are patches of the tufted hairs produced by the irritation due to the action of the minute white gallmites which may be seen under a lens swarming on the leaves. They appear to burrow in the soft tissue parallel to the midrib or vein and produce this morbid outgrowth partly of cortex and partly of hairs.

The commonest gall produced on the ends of the branches is about an inch long rounded but thickly covered with processes so as to resemble the fruit of a chestnut. Another I have more rarely seen is oval or globose beaked about two inches long and an inch through at the thickest part, and perfectly smooth and shining when dry.

These galls all occur on big trees as well as on young plants and are very characteristic of the species.

The tree is abundant in the jungles of Singapore, Malacca, Perak and Selangor. It flowers only once in six years, so that its flowers and fruits are rarely to be met with but when it does fruit it produces a great deal of seed, and seedlings spring up in vast numbers near a tree after flowering. The growth of a tree is very slow, but I have but few data as to its growth. A tree of nine years of age is about ten feet tall and about 4″ through at the base. Another tree which could not be more than 15 years old was about 30 feet in height and 6 inches in diameter, its wood showed 16 rings of growth but they were rather obscure and ill-marked.

The stem and branches when cut or broken exude a quantity of Damar, sometimes clear and transparent, but becoming yellow outside. A good deal of the ground damar which is dug up in Singapore and elsewhere, appears to have originally been derived from these trees. The timber of young trees at least is that of an ordinary Serayah, the rings rather distant, pores moderate size; the heart-wood distinct reddish, a tolerably light and good Serayah.

Weight 55 lbs. ¼ oz. (Maingay) S. 54 lbs.

The wood commonly known as Seraya Batu is stated to be derived from this tree, it is a harder and closer-grained dark brown wood with numerous smaller pores.

This wood is much valued for planks, boxes, etc., but is seldom

used for beams. It appears to be, however, very inferior to Sal. (*Shorea robusta*) nor can it be compared with Damar laut, or Resak, other species of *Shorea*. As, however, it is much in demand and is easy of cultivation, it might well be planted where possible.

All the Serayahs are liable to destruction by Termites, especially the house Termite (*Cœlotermes domesticus*). I have found soaking the wood in copper sulphate solution to make it less liable to destruction in this way.

S. macroptera Dyer. Kepong, Kepong Hantu.

A tall tree 60 to 80 feet tall, about 2 feet through without buttresses. Bark grey nearly smooth. The leaves stiff oblong rather narrow. Flowers small pink.

Fruit nut oval acute an inch long, wings four inches long and one across with 8 longitudinal veins, and much reticulated yellow, base enlarged round the nut, then slightly narrowed broadening towards the rounded apex, the small wings not half as long very narrow linear.

Flowers every sixth year. Common in Singapore, Malacca, Penang and Perak.

The wood is dark red with close rings, the pores are fairly large, medullary rays conspicious with silvery transverse connecting bars. Weight 22 lbs. 15 ozs.

Not considered a very good wood, but used for building. The bark is used for houses and rice-bins. It is thick and firm, dark red brown in color, and was formerly much used for walls of houses especially in Malacca, but its use is dying out as it becomes more difficult to procure, and planks are more easily obtainable owing to the opening up of the districts where it was used. It is stated to be strong enough to resist a rifle bullet, but it was open to the objection that it was very dusty.

The Kepong produces also a Damar.

Sh. parvifolia, Dyer. Serayah Samak, Meranti daun kechil, Meranti kerap.

A big tree about 100 feet tall, and three or four feet through. Buttresses usually strong and thick. Bark red and rough with broad vertical flakes, but often covered with lichens so as to conceal the red color. Inner bark white. Leaves small ovate or ovate lanceolate, dark green and rough in texture.

Flowers small, and rather scattered on the panicles, white.

Timber reddish but rather light in colour, pores very numerous of medium size, a rather soft and not very heavy wood, containing a good deal of damar deposited in cracks. It is apt to split. A good ordinary Serayah, suitable for common furniture, etc., occurs in Singapore, Malacca, Penang and Perak. Weight 36 lbs. 13 ozs. (Maingay) S. 39 lbs.

Sh. acuminata, Dyer. Rambeh Daun, Meranti Payah, Serayah Batu, (Maingay).

A large tree with rather stiff ovate or ovate lanceolate leaves oblique at the base, acuminate, slightly hairy beneath. The stipules

which are large oblong and red persist for a long time on the branches, giving the tree a peculiar appearance.

The wood is one of the Serayah type, bark red and compact, hard and close grained, and may be considered a good heavy serayah, useful for house building, bridges and planking. Weight 44 lbs. 10 ozs. (Maingay) S. 40 lbs. 8 ozs.

It is abundant in Malacca.

Sh. sericea, Dyer.

A tall tree about 60 or more feet in height, with elliptic oblong leaves tomentose on the back.

A light red wood with a good gloss on it, the rays being red, and the rays being silvery grey. The pores are rather large. A very fair Serayah, suitable for planking and furniture work. Weight 20 lbs. 11 ozs.

Sh. Curtisii, King. Meranti Tahi.

A big tree 100 to 150 feet tall.

This has a soft light red wood fine grained, with medium sized pores and fine rays. It is suitable for furniture and light work generally, being of a good colour and figure. Weight 30 lbs.

It occurs in Penang and Perak.

Sh. rigida, Brandis.

A big tree, 100 feet and upwards.

Bark rough ½ an inch thick, sapwood loose textured and light coloured. Heartwood red, rings distinct and close, pores numerous, fairly large often sub-divided, rays fine rather irregularly spaced. Fairly heavy a good furniture wood. Weight 36 lbs. 3 ozs.

Not common, Singapore and Negri Sembilan.

Shorea utilis, King. Damar laut No. satu.

A magnificent tree, with black branches, and long pointed lanceolate leaves, blunt at the ends, three inches long and 1½ wide dark brown and shining when dry, chocolate beneath.

The timber is of the highest class, being very durable. It is heavy and of remarkable tenacity with toughness and strength nearly equal to Daru but it is less stiff (Howard Newton). It is of a dark brown colour when old, yellower when fresh cut, the pores are numerous but small, the rings distinct, and the rays very fine. The wood is highly resinous. Weight 72 lbs.

This one of our finest hard woods formerly grew abundantly in Penang and Province Wellesley especially near the sea. It has now, however, become scarce as it is a local plant and has nearly been exterminated.

Sh. barbata, Brandis. Resak.

A large tree, the bark is one-third of an inch thick, brown, and splitting off in thick scales. The leaves are ovate, acuminate with a blunt point, when dry dark brown above and pale beneath.

The sapwood in this tree is large for a Shorea, 1½ inch thick in a six inch tree, brownish in colour. The heart-wood is deep brown

hard and heavy, the rings fine and distinct, the pores numerous. Weight 53 lbs.

This plant with its wood was sent to me from Tampin as Resak, but it is not what is commonly known as Resak in Johore and elsewhere, although the timber is very similar. It has never been met with elsewhere.

Sh. gratissima, Dyer.

Tree rather smaller than most of the Serayahs. Leaves small 2 to 3 inches long, ovate blunt quite glabrous, coriaceous, polished. Flowers small white secund with a pubescent calyx. Fruit small, wings narrow $2\frac{1}{2}$ inch long, $\frac{1}{4}$ inch wide. Not a very common tree here. I have only met with it in Singapore.

The wood is said to be cross-grained, the heart-wood brown, very hard.

Hopea.

The trees of this genus resemble the Shoreas, but the flowers are usually much smaller and there are only two long wings to the fruit instead of three.

About eight species are known from the Peninsula.

H. intermedia, King. Jankang, Merawan Kunyit, Mengarawan.

A very tall straight tree attaining a height of 100 feet and a diameter of 6 feet, the bark is brown and conspicuously longitudinally furrowed. The leaves are ovate, lanceolate, caudate, perfectly smooth above and very close veined beneath. The flowers small, the fruit is small with red oblanceolate wings with about 7 veins and $1\frac{1}{2}$ inch long. A dark brown rather coarse wood, with rather large pores, and fine but obscure rays. A peculiarity of this wood is that the rings are often marked out with irregular thin white lines. These consist of lines of pores filled up with solid damar. This gives the wood in transverse section an appearence of having white threads through it whence it is sometimes known as Meranti sutra. Weight 45 lbs., 37 lbs. 2 ozs.

Merawan is generally considered as an inferior Serayah and used for the same purposes. A good deal of the common planking sold as Serayah, appears to be Merawan. The tree is very common all over the plain country.

Anisoptera.

There are several species of this genus in the Malay Peninsula. All are gigantic trees resembling Shoreas, but distinguished by the fruit which has the calyx tube adhering to it, so that the two wings appear to rise from the top instead of from the bottom of the fruit.

A. Curtisii, Dyer. Rengkong.

Has narrow oblong leaves tapering to both ends and covered with yellow scales beneath, especially conspicuous when dry.

The wood is of a light yellowish colour, with rather large pores and very fine close rays; rings tolerably regular but not very dis-

tinct. It contains much resin in the cells, and is a rather heavy useful wood. It occurs in Penang and Perak.

Weight 47 lbs. 4 ozs.

A. costata, Korth. Mersawa Ular.

A large straight tree with strong buttresses, attains a large size, the bark is light whitish coloured.

Leaves large oblong six inches long and two across, hard and coriaceous blunt, the upper side smooth and polished, the underside strongly veined, reticulate, pubescent. The flowers are yellow with acute petals ½ an inch across. The fruit is globose and smooth, with two large oblong wings over six inches long and an inch and a-half across with three strong ribs and many transverse bars, the other two wings are small.

The wood is hard and heavy dull brown in colour and fine grained, the pores very small.

For some reason this is not a very highly prized wood, though it is undoubtedly a good second class timber.

A. glabra. Mersawah Merah.

Has thinner leaves ovate lanceolate to lanceolate acuminate glabrous finely reticulate. The fruit is small about as big as a large pea, the wings narrow blunt lorate with three strong nerves.

Altogether a small tree in all parts. The wood is light and floats in water.

Shorea Thiseltoni King? Balau (Pahang.)

This is entirely different from the original Balau (*Parinarium oblongifolium*). The specimens I have received from Pahang collected by Mr. Hill have slender black twigs, leaves ovate acuminate with a broad base, 8 inches long and 4 inches wide, upper side dark green back lighter, nerves alternate about 23 prominent on the back, with conspicuous transverse nervules close together, the petiole is rather slender and an inch long.

This is I believe the Rumpin river Balau.

S. Sp. Tampoya mas (Penang)

Wood light red with rather large and numerous pores and fine rays. Has a good gloss and is rather prettily figured. Weight 3 ℔s. 14 ozs.

Vatica cinerea, King. Pinang baik.

A medium sized tree about 60 feet tall, wood hard and heavy light yellowish brown resinous, pores medium sized, rays very fine and close. A good timber but apparently scarce only occurring in Penang and Kedah. Weight 72 ℔s. 7 ozs.

Dryobalanops.

A genus of only four species of which one occurs in the *Peninsula D. aromatica,* Gaertn. This is the Camphor tree of Borneo. (Kapur Barus) and is indeed the first known Camphor plant (sixth century). The Japanese Camphor not being known till later. The tree only occurs as far as is at present known in the Penin-

sula in two spots on the river Indau, in Johore, and at Rawang in Selangor. It is also met with in Sumatra, Lingga and Borneo. It occurs in forests almost entirely composed of this tree and its seedlings, to the exclusion of other trees. The plants growing very close together and forming a dense jungle. The tree grows to a height of about 150 feet, and are three or four feet in diameter, with a straight stem bare of boughs for about eighty feet, at the base buttresses are thrown out but of no great size. The bark is rather thick grey and covered with thin long flakes. It is about half an inch thick, the inner bark reddish and the cambium layer yellowish brown with a turpentine smell when cut. The leaves are ovate coriaceous with a long point.

The timber of Camphor wood is of first class quality. There is not much sapwood in large trees. The heart-wood is deep red heavy and close in texture, the pores moderately large, the rays very numerous and thin. It darkens with age and possesses a strong turpentine odour, due to the oil of Camphor inclosed in the resin ducts. When polished it resembles Mahogany. It is very durable and fallen trees in the jungle remain sound though the sapwood is rotted away for a considerable period. Weight 43 lbs. 8 ozs. to 51 lbs. 4 ozs.

Laslett (Timbers and Timber trees p. 138) says it is moderately hard and tough. Its defects are a sponginess about the concentric layers combined with the prevalence of a star shake very detrimental to the quality and usefulness of it.

Oil of Camphor is obtained by cutting holes in the tree as described for the wood oils (*Dipterocarpus*). And also is found sometimes in hollows in the trunk. Motley obtained in a tree in Labuan which was cut down five gallons of oil in a single hollow, and much was lost beside. It may also be obtained by distillation, the wood is cut into chips and put into water which is then heated, the oil coming over in the steam. The Malays value Camphor oil very highly, using it in medecine.

The Camphor is found in fissures of the wood in a crystalline form, Spenser St. John, in Life in the Forest of the Far East states, that the finest is often found in decaying trees. In some timber brought to Singapore in 1896, I found that Camphor crystals were formed in small holes in the wood, after it had been left for some time, but attempts to obtain solid Camphor from the timber artificially have as yet proved unsuccessful. Further attempts may prove successful and experiments may well be made in this matter as this Camphor is valued at about 80 or 90 shillings a pound. Its use is almost exclusively confined to China, Cochin-China and Siam, being too expensive for the European markets. It is harder and less volatile than common camphor.

The cultivation of this superb tree would be well worth undertaking if for its timber alone. It is apparently of slow growth like other hardwood trees, but it could be easily propagated by seed, or the young overcrowded seedlings in the Camphor woods could be transferred to localities where they might have more space to grow in.

Pentacme malayana, King "Temah Batu".

A straggling much branched tree of no great size about fifty feet tall with very thick brown bark nearly an inch through, rough and longitudinally ridged leaves rounded ovate, or elliptic.

Flowers rather large ⅔ of an inch across white with spreading petals, produced in the dry season when the tree is nearly leafless in few flowered panicles.

Fruit red ovate, the three outer calyxlobes enlarged and recticulate 4 inches long, the two minor ones narrower, 2 inches long.

Sapwood and heartwood distinct, the former yellowish fairly hard. Heartwood hard and close deep brown, rings large and distinct, medullary rays very fine and numerous. Pores numerous. Weight 70 lbs. 3 ozs.

Lankawi Islands. This curious tree grows on limestone rocks above the sea. It is rather irregular in habit and would in most places be difficult to get good beams of. The timber resembles, however Damar laut, and would evidently be of first class quality if procurable in quantity and of good size. The allied *P. siamensis* is said to give a highly prized and durable wood. (Pierre flor a for Cochin-china (Gamble).

Balanocarpus.—In this genus, the "Chengei" of the Malays, the fruit is a globose or conical nut, enclosed at the base in a cup formed of the enlarged calyx, something like that of an acorn, and with no wings. The trees are usually large, sometimes gigantic.

The Chengeis are as regards the timber all very much alike, hard and yellow when fresh cut turning eventually dark brown.

Chengei Tandok, is a very large tree, the timber of which is very close grained and fairly heavy, the pores very numerous and close rather large, and usually contain much resin, the rays are darker than the woody fibres, close and conspicuous. It is a very good timber, for beams, machinery work, boats, etc., I met with it in the Dindings.

Weight 49 lbs. 8 ozs. to 56 lbs. 6 ozs.

The Chengei of Province Wellesley is *Balanocarpus Heimii,* King., and Wray says that *B. Wrayi,* King, of Perak is known there as Chingi or Chingal.

B. pinangianus, King. Damar hitam.

Is a big tree about 60 or 70 feet tall, about 18 inches through, occurring in Penang and Perak.

The wood is fairly heavy but rather loose in texture for the genus, the pores are medium size, and the rays very irregular. It is of the same yellowish colour when fresh cut as are many of the other Chengeis.

Weight 4 lbs. 3 ozs.

B. maximus, King. Penak, Chengai.

A vast tree growing chiefly on the hill ranges of Selangor, and also in Johore. It has stiff oblong or elliptic leaves. The bark is very thick nearly an inch through and corky. The fruit is about 2 inches long cylindric, the sepals forming a toothed cup at the base.

The timber is very highly valued, it is rather light yellowish brown darkening with age as do the others of the genus, with large and scanty pores and distinct rings. Weight 59 lbs.

A very durable high class timber, highly valued for buildings and boats.

Vatica Sp? Resak Buah; Damar Laut (of Johore).

A very good timber dark brown in colour but lighter than Damar Laut No. satu, close in texture with very close fine pores, very obscure rays and usually distinct rings. Weight 30 lbs. 10 oz., to 54 lbs.

Vatica Teysmanniana, Burk. Giam (of Sumatra).

I met with this tree in Siak and obtained leaves and fruits, and think I have correctly identified it. It is a large tree 90 to 100 feet or more tall with rough bark, and much Damar. The leaves (of young plants) are elliptic acuminate with a long blunt point, 6 inches long and 1½ inch wide, nerves arcuate reticulate, young leaves on the back and petioles (½ an inch long) scurfy tomentose. Fruit globose ½ an inch long calyx lobes, 2 developed into oblong wings narrowed at the base and free from the fruit 2 inches long ¼ inch wide, lesser wings ¾ inch long narrow acuminate. Wood dark brown not very heavy, rays fine and close, pores very numerous small, no rings. Beams 90 feet long are said to have been obtained from this tree.

A sample of wood sent me as Kemaman Balau much resembles this. It is a very good timber and is valued highly for building. Leaves of a plant called Giam in Pahang obtained by Mr. H. C. Hill seem to belong to an entirely different tree probably a *Shorea*.

Damar putih described by Newton closely resembles Giam. It was obtained from Langkat, and Newton states it is well suited for piles as it is not affected by sea-worms.

Supplementing Mr. W. W. Bailey's paper in the last Bulletin on the attacks of white ants on Para Rubber, I take from a Pamphlet issued by the "Imperial Department of Agriculture in the West Indies" the following methods of combating insect ravages. There can be no doubt that one of the worst evils the Planter has to contend with is the ravages of insect pests in various forms; it is therefore absolutely necessary that he should be equipped with all possible information for combating those ravages. As insect attacks are very similar in all tropical countries, the methods of destruction given in the following paper will be applicable in Malaya with perhaps very slight modifications in certain cases which will be readily understood by the Planter. The prices of some of the constituents of the recipes given are what they can be had for in the West Indies, so that they must be taken as approximate only of what they can be purchased here. The same remark applies to the different spraying apparatus.

GENERAL TREATMENT OF INSECT PESTS.

This paper contains brief directions as to the means to be adopted for the destruction of garden and crop pests. In such small space elaborate methods, applying to special cases, cannot be discussed but the directions given may be modified with discretion and rendered applicable to ordinary insect diseases. Many of the remedies described are derived from the published work of entomologists in other parts of the world and are such as have been found to give the best result under the conditions obtaining in the West Indies.

Determination of the cause of Disease.

When a plant is supposed to be diseased, it should be carefully examined to find the cause of the injury and any unusual appearance should be noted. There may be some difficulty in discovering, with certainty, the real source of damage but a thorough examination of the plant, in cases where the disease is not at once apparent will, as a rule, reveal the true nature of the injury and its cause. It is of no use to assign the damage to the first or to any insect that may be found on the plant, and if treatment is adopted for the wrong class of pest the best results are not likely to be obtained.

Insect Pests.

Plants are attacked by diseases and pests of very various kinds, of which insects form a large proportion. Speaking generally, harmful insects may be divided into three classes according to their mode of attack :—

(1) Leaf-eating insects.
(2) Boring ,,
(3) Sucking ,,

Leaf-eating Insects may be taken to include those that feed on the leaves and other exposed parts of the plant. Caterpillars (" worms ") are the most common, and grasshoppers often do a considerable amount of harm. A well known instance of caterpillar attack is found in the Para Rubber tree whose leaves are sometimes eaten by large numbers of caterpillars. Other familiar instances are the caterpillars that attack the water-lemon vine, canna, arrowroot, tobacco, sweet potato and cassava. As a rule each kind of caterpillar confines itself to one food or to closely related plants.

Boring Insects feed inside the tissues of plants, spending the greater part of their lives securely hidden. All parts of plants are attacked, the plaintain weevil living in the roots or in the part of the stem below the ground, the cocoa beetle tunnelling in the trunk and branches, and the coffee-leaf miner boring in the leaves are familiar examples. Other boring insects live in dried grain, tobacco, nutmegs, furniture, etc.

Sucking Insects are, at the present time, the most destructive insect pests in the West Indies. They include the plant lice (Aphidæ) the mealy-wings (Aleurodidæ), and the scale insects

and mealy bugs (Coccidæ). These are all minute insects that suck the juice through the slender tube which is inserted into the tissues of the plant. Instances of this form of attack are sufficiently familiar, though the cause is not always recognized.

Trees are commonly to be found covered with "black blight", that is, the upper sides of the leaves are coated with a black layer like soot. It is often thought that this is a serious disease at present, but it is not the black blight. If the underside of such a leaf be examined, either mealy-bug will be found or small rounded insects, (scale insects). These are the real pests, the black blight being merely a secondary result. A plant with black blight will be found to have scale insects on the leaves or branches, or else a neighbouring tree is thus infested. Black blight, in itself, does little harm, it is a fungus that lives on the sweet excretion dropped by the scale insects and may be regarded as an indication of the more serious disease. When the scale insects are destroyed, the black blight will in time disappear also, and the plant will regain its normal vigour.

Scale insects may be found on any part of a plant, some attacking the roots, others the stem, branches, leaves or fruits. Other sucking insects occur, but they are usually of far less importance.

PREVENTIVE MEASURES.

Before discussing what remedies to apply, it may be of use to consider how to guard against the attacks of insects and other pests. The point of greatest importance is to maintain the vigour of the plant, to keep it in as healthy a condition as possible and never to allow it to become weak. Plants are particularly liable to disease when thay lose vigour, as in time of drought. An additional preventive is to ensure the absence of weed, and of decaying vegetation of any kind. Rotting fruits, trunks or branches offer a convenient home to many undesirable insects, and should be dug in, when possible, or removed. If disease comes, it is essential to check it at the outset. A pest should never be allowed to become established, vigorous measures should therefore be taken as soon as it is observed. A small amount of trouble at the beginning may save much labour afterwards, and may preserve the crop from injury. It is most important to be always on the watch for signs of injurious insects, and, as soon as they are seen, to adopt immediate and thorough measures for their destruction.

REMEDIES.

Insects may be destroyed in two ways (1) by catching them and (2) by poisoning them. For boring and leaf-eating insects both methods may be used, for sucking insects the latter only, as a rule. In applying these remedies, it must be remembered that many insects pass through three stages. From the eggs comes the caterpillar (worm) or grub, which is usually the destructive stage. After this has attained its full size and stored up fat, it transforms itself into the chrysalis or pupal stage. This is a resting stage, often passed in a cocoon or other covering, in or on its food plant,

or in the ground. From this resting condition the full grown insect emerges, and this period of an insect's life is usually devoted to reproduction, the food, stored up as fat during the caterpillar or grub stage, being sufficient, in many cases, also for the perfect insect. All insects do not pass through these well-marked stages but no insect has wings until it has attained its perfect shape. These facts must be remembered in dealing with moths, butterflies, beetles and two-winged flies, as it is often possible to find one stage in their life when some remedy will be particularly effective.

Insects may be caught in several ways. The grubs of boring beetles can usually be cut out of the trees they attack. This must be done carefully, with as little injury to the tree as possible and the wound should be immediately tarred over. Trap logs are useful in some cases. If it is found that the perfect insects will attack other trees logs of these trees may be left lying on the ground to attract the beetles. These must be visited periodically and burnt when they contain a large number of the insects. Catching the perfect insects by hand, as in the case of cacao beetles or grasshoppers, and catching them in trays of molasses are also often valuable methods.

The selection of particular methods depends on a knowledge of the habits of the insects, and the methods need to be modified to suit different insects. It is often convenient to catch some insects at one particular stage. Thus, boring insects are often well hidden in their early stage but emerge when they become perfect, then they may be caught. On the other hand, it is easier to destroy the caterpillars that eat many plants than it is to kill the butterflies or moths into which they eventually turn. Occasionally the eggs is the most readily destroyed stage in an insect's life. It is desirable therefore that full advantage should be taken of these points.

The use of poisons offers a method that is generally applicable to insect attacks. Poisons are of two kinds, "Stomach-poisons" and "Contact poisons". The former destroy insects when eaten with their food, the latter destroy them when they come in contact with their bodies. Insects that bite leaves, bark or fruit and eat what they bite, can be killed by putting a stomach-poison on their food. These poisons are enumerated in list *A*. Clearly, this method is of no use against sucking insects, which push a slender tube into the plant and do not eat the outside. For these, contact poisons are used, and since many sucking insects are fixed to the plant or move but little, this method is very effective, for such poisons see list *B*.

A number of poisons are enumerated below, with directions for preparing them. By their aid the greater number of insects may be destroyed, provided the applications are thorough and systematic. There are many insects that need special treatment and the application of these poisons needs slight adaptation in many cases. A knowledge of the habits of the pest is the surest guide to good results, and the least amount of treatment will then give the desired result. Substances poisonous to man should not be applied to fruit or vegetables immediately before they are to be picked.

Poisons.

List *A*.—Stomach Poisons.

Arsenical Poisons.

1. Paris Green, mixed with twice its weight of flour, dust or lime, both finely powdered.
2. Paris Green, 1 lb. with 2 lbs. of lime, dissolved in 200 gallons of water.
3. London Purple, mixed with twice its weight of flour, dust or lime, both finely powdered.
4. London Purple, 1 lb. with 2 lbs. of lime dissolved in 180 gallons of water.
5. London Purple or Paris Green may be used with soap, by adding 1 lb. of soap to every 50 gallons of Nos. 2 or 4.

Other Poisons.

6. Hellebore, mixed with twice its weight of cheap flour, both finely powdered.
7. Hellebore 1 oz. in 2 quarts of water.
8. Pyrethrum (Buhach), mixed with twice its weight of cheap flour, both finely powdered.
9. Pyrethrum (Buhach), 1 oz. in 1 gallon of water.
10. Tobacco (refuse), as dry powder.
11. Tobacco (refuse), 1 lb. steeped in 1 gallon of water for 24 hours.

List *B*.—Contact Poisons.

12. Kerosene Emulsion (hard soap).

    Dissolve ½ lb. of hard soap in one gallon of boiling water, add two gallons of kerosene to the hot liquid and immediately churn, with a syringe or force pump, till the mixture becomes creamy. This is the stock solution. Make up to 33 gallons. Use only rain water, or soft water *i.e.* without lime, etc.
13. Kerosene Emulsion (soft soap).

    Dissolve 1 quart of soft soap in 2 quarts of hot water, add 1 pint of kerosene to the hot mixture and immediately churn, with a syringe or force pump, till the whole is creamy. Add an equal amount of water, and it is ready for use. Any water may be used.
14. Rosin Wash.—Mix 20 lbs. of rosin, 3½ lbs. of 98 per cent. caustic soda, and 3 pints of fish oil. The rosin and caustic soda must be pounded before mixing. Cover this with about 2 inches of water and boil. When the liquid is clear, slowly add water, still boiling the mixture, till the whole is made up to 15 gallons. This is the stock solution and can be made up to 100 gallons when cold, using only rain water or soft water.
15. Rosin Compound.—Mix 4 lbs. of powdered rosin, 3 lbs. of powdered washing soda, and when all is dissolved, slowly make up to 5 gallons. Boil the mixture till it becomes of a clear brown colour. This is the stock solution. Make this up to 30 gallons.

16. Whale-Oil Soap.—Dissolve 1 lb. of soap in one to two gallons of warm water.
17. Rosin and Whale-Oil Soap Compound.—Mix 1 gallon of water with 3 lbs. of powdered washing soda and 4 lbs. of powdered rosin. Boil till dissolved and, while boiling, make up slowly to 5 gallons.

    In a separate vessel boil 10 lbs. of whale oil soap with 5 gallons of water. These may be mixed while hot to make the stock solution or, when cold, mix these two with 35 gallons of cold water, pouring both into the water together while actively stirring the mixture. However mixed, the final amount must be 45 gallons.
18. Tobacco and Soap.—Dissolve 1 quart of soft soap, or ½ lb. of hard soap in 5 gallons of water, and add 2 quarts of strong tobacco decoction (No. II.)

Use of The Poisons.

The poisons enumerated above are to be applied as follows:—Those in list *A* are suitable for application to plants that are eaten by caterpillars (worms) and other biting insects. The arsenical poisons, such as London Purple or Paris Green, are of universal application against caterpillars and other pests that destroy foliage, but it must be remembered that arsenic is poisonous to man and does not quickly get entirely washed off by rain. Hellebore, on the other hand, very soon loses its poisonous properties and becomes harmless after some exposure to air. Pyrethrum is harmless to higher animals, but has a powerful influence on insects. It may be applied without danger of poisoning human beings or cattle. Tobacco has a special value in a few cases only, and has less claim to be regarded as a general insecticide. Those in list *B* are the contact-poisons for application to plants infested with mealy-bug, scale insects, etc.

When using large quantities of these insecticides, the question of relative cost becomes important.

The prices of the materials mentioned in list *A* are subjoined, as quoted in New York:—

Paris Green - - - -	25 cents per lb.
London Purple - - -	6-15 cents per lb.
Hellebore - - - -	20 cents per lb.
Pyrethrum - - - -	35 cents per lb.

In Barbados (Messrs. C. F. Harrison & Co.) the following may be obtained:—

Paris Green - - - -	54 cents per lb.
London Purple - - -	30 cents per lb.
Refuse Tobacco - - -	4 cents per lb.

The cost of washes in list *B*, has been calculated, per 100 gallons of wash ready for application, exclusive of fuel and labour. These figures are approximate and represent, as closely as possible, firstly, the cost of the materials in large quantities in Barbados, free of duty, and secondly, the cost at retail prices as quoted in Barbados.

Cost per 100 gallons :—

Rosin Compound - - -	$ 0.70	$ 0.91
Rosin Wash - - - - -	1.29	1.90
Rosin & Whale Oil Soap Compound	1.47	2.15
Kerosene Emulsion (Hard Soap)	1.87	2.87
Whale Oil Soap (strong) - -	4,50	10.00
Kerosene Emulsion (soft soap) -	22.40	35.20
Tobacco and Soap - - -	1.00	

These washes vary in ease of preparation and in keeping quality. They can be made, on a small scale, in empty kerosene tins, enough stock solution being thus made in one tin to make 30 or more gallons of wash when made up to the full amount. In making Kerosene Emulsion with hard soap, water containing lime should not be used, as the oil will separate out in the surface making the emulsion ; rain water or soft water is necessary in this case and is preferable for all washes. In selecting a mixture, it would usually be better to choose one of which the ingredients could be easily obtained. But, if a large area is to be sprayed, as in spraying lime or orange trees, it would be well to import the materials on a large scale and then the most efficacious wash could be chosen. The strengths of these washes are intended for plants whose foliage is not very tender or delicate. Many plants, such as palms, would bear much stronger washes ; on the other hand, very delicate plants might suffer from a too liberal application. The strength of these mixtures may be varied considerably and they should be made weaker for very delicate plants.

Application of Poisons.

The liquid preparations are best applied with a spraying machine, but a brush or good syringe may be used for small plants. The object to be attained is to uniformly wet the affected parts with the liquid ; a fine spray like a mist usually does this best, and only a good spraying machine is capable of giving such a spray. Many kinds of spraying machines are now in use and can be obtained from the makers, or from firms dealing in gardening implements. A spraying machine consists essentially of a reservoir containing wash, a small pump, and a length of india-rubber hose, terminating in a nozzle that will give a spray of varying fineness. The success of the treatment depends largely on the nozzle and a thoroughly reliable one is that known as the "Bordeaux" or "Seneca" nozzle. The india-rubber tubing does not last long in the tropics and a spare length should be obtained with the machine. Spraying machines are, as a rule, made of copper or brass, as they are not then affected by the constituents of the wash used. Two forms of machines are generally used. The smaller are known as "Knapsack" machines and can easily be carried strapped to the shoulders. They are so made that one man can operate the pump and also direct the nozzle whilst walking with the machine on his back. Such machines will hold about 4 gallons of wash. Larger machines are fitted into a barrel, which acts as a reservoir, and the barrel is carried on a light iron truck with two wheels. These machines

have a capacity up to 50 gallons and can easily be pushed from place to place. Shrubs and small trees can conveniently be sprayed with an ordinary length of hose and a metal extension pipe allows for treating taller trees. There are several good machines obtainable, especially in the United States. Those most in use in the West Indies at the present time, are manufactured by the Deming Company, Salem, Ohio, and by the Gould's Manufacturing Company, 16, Murray Street, New York. The "Success" knapsack spraying machine made by the former company and the "Fruitall" spraying machine made by the latter may be seen at the Botanic Station and are thoroughly reliable. The following can be obtained from Peter Henderson & Co., 35, Cortlandt Street, New York.

"Success" Knapsack Sprayer ...	$11.00
"Henderson" Garden Spray Outfit	6.00
"Henderson" Hand Bucket Pump	3.75
"Fruitall" Spray Outfit "A" ...	10.00
"Gem" ,, ,, "A" ...	5.00
"Pomona" ,, ,, "A" ...	13.50
"Sentinel" ,, ,, "A" ...	34.00

The "Fruitall", "Gem", and "Pomona" have to be fitted into the end of a barrel similar to that imported into the West Indies with cooking oil, usually blue outside. This barrel can then be mounted on Henderson's water-barrel truck (costing $11.00), and the whole forms a very convenient and powerful machine. The "Sentinel" is a more powerful pump, and has to be fitted on a cart, with a barrel to supply the wash. It works two nozzles at once.

The "Henderson" hand bucket pump fits any bucket or small tub and is adapted only for treating small plants, ferns, etc. The "Henderson" garden spray outfit is a more complete arrangement of the same machine. There are many more outfits for spraying plants, but the above list will enable any one to provide himself with a reliable machine. When ordering it is necessary to specify the "Bordeaux" or "Seneca" nozzle, which appear to be the best.

Powders are applied by dusting them over the plant. This may be done with a tin can perforated with small holes, or by placing the powder in a coarse sack and beating it. Special appliances for blowing powder are found very useful in applying Paris Green, sulphur, or other finely powdered poisions. The "Little giant powder gun" is one of many forms sold by dealers in gardening implements, and may be obtained from P. Henderson & Co. 35, Cortlandt Street, New York, for $5.00, complete.

Thoroughness in application is absolutely essential to success.

Next in importance is observation of the results and repetition when necessary. One dose is often sufficient, but, for scale insects, more applications are required. The first dose will destroy the mature scale insects but not their eggs and a second or third dose, at intervals of about a week, are usually necessary.

Other Remedies.

Trees may often be preserved from the attacks of boring insects

by white-washing with lime and water. This requires renewal once in three weeks. Special preparations are sold for applying to trees. In the form greasy mixtures, rosin and castor oil, whale oil-soap and washing soda, soft soap and carbolic acid are recommended for this purpose, but these must not be allowed to remain long on the trees. After 2 to 3 months, at most, they should be washed off. Trunks of valuable trees can be protected by tying tarred paper, or newspapers, around them, or by fixing wire netting one inch away from the bark closed at the top and bottom. Lime, ashes and soot can often be employed very usefully in gardens, especially against snails and slugs.

Stored crops are very liable to the attacks of insects. Grain may be freed from weevils by exposing it for 24 hours in an airtight receptacle, to the fumes of carbon bisulphide at the rate of 1 teaspoonful (1 drachm) per cubic foot of space. This will kill every insect within 24 hours and will not damage the grain. Carbon bisulphide is obtainable in cans from 7 lbs. upwards at about 5*d*. per lb. in England or the United States. Benzene may be used in the same way, taking rather more per cubic foot as it is less powerful. As both these substances are very inflammable, care must be exercised in using them. Cockroaches can be destroyed by mixing equal parts of molasses, or chocolate, and boracic acid, and spreading this on small pieces of tin or cardboard, which are placed in cupboards or under furniture. The mixture is not poisonous to dogs and other domestic animals, but will destroy the cockroaches. Books in the tropics should always be lightly painted over with the following mixture to preserve them from cockroaches :—

1 oz. Corrosive Sublimate.
1 oz. Carbolic acid.
2 pints Methylated or Rum spirits.

The paste use for binding books and similar work should be poisoned by adding half an ounce of copper sulphate (blue stone) to every pound of paste.

Wicker and other furniture attacked by small beetles should be thoroughly painted with kerosene oil and then placed in the sun for a few days. Woollen goods, clothes, etc., can be preserved from the clothes' moth by the use of naphthalene, but better by being thoroughly sunned for a whole day once every two months.

Useful Insects.

Insect pests, like other organisms, have enemies that prey on them clearly, these are of value and deserve to be encouraged. A common pest destroyer is a green fly about an inch long with large transparent wings, and beautiful golden eyes, which emits a very unpleasant smell. Its eggs are found on the bark or leaves of plants infested with plant-lice, and are easily recognizable, resembling small white grains on a slender stalk. The grub is a very voracious animal and devours large numbers of plant lice, etc. Other useful insects are the small round beetles known as ladybirds. Their grubs are usually coloured black and yellow, and are very

active. They eat large numbers of plant lice, away from which it is rare to find them.

Should other parasitic or predaceous insects be found, they should be preserved; but as a rule it is not an easy matter to determine those that are useful, without a special study of their habits.

Introduction of Pests.

It is a very easy matter to introduce injurious insects or plants from other localities and care should be taken to avoid doing this. A pest introduced into a new locality is likely to be more destructive than those already established there. Cuttings, plants or seeds are very likely to carry the eggs of scale insects, or the scale insects themselves, and all importations should be examined on arrival. If possible, it is wise to plant such things by themselves so that any disease that may show itself will not readily spread and can be treated before the plants are put out with others.

Sources of Danger.

Badly diseased plants, if few in number, should be cut down and burnt, lest the disease spread to neighbouring plants. This is always necessary even with scale insects and mealy-bugs. A diseased plant should never be cut down and left lying on the ground. Any pest on it will spread to other plants on which the insects can live, since they will at once leave a plant when the sap ceases to flow. It is sometimes possible to discover the sources of insect pests. Some trees are continually attacked by scale insects and they communicate their pests to many others of various kinds. In Barbados, the Frangipani trees are very dangerous in this respect, having usually scale insects that will live on a great variety of other trees and shrubs. It would be of little use to treat the other trees and leave the Frangipani, as it would immediately communicate the disease afresh. Such dangerous trees should not be allowed to grow near fruit trees or valuable ornamental plants.

Collecting and Forwarding Specimens.

Injurious insects may be forwarded for examination to Director of Botanic Gardens, Singapore. They should in every case be so preserved and packed as to arrive in the best possible condition for examination.

Flies, butterflies, moths, bees, etc. should be dried and, if possible, either carefully pinned or at any rate prevented from rolling about and becoming injured.

Soft-bodied insects such as caterpillars, grubs, "worms," etc. are best preserved by being dipped in boiling water and then dropped into a small bottle of strong spirit or rum. They may also be placed in the spirit direct, which will be sufficient to preserve them.

Beetles should be sent wrapped up in paper or in any other soft packing material, but no insect should be packed directly in cotton wool; a layer of paper should always be placed between the cotton wool and the insect. Scale insects are best preserved on the leaf or part of the plant they attack. Several leaves should be dried carefully, packed and forwarded in a box. It is often possible to

send living insects especially those that bore in plants or live in earth. They should be supplied with food but no provision need, as a rule, be made for air. In every case a specimen showing the damage done should be sent. When possible living insects, on or in their food plant, should be forwarded and if there is risk of the insects dying a few should also be sent preserved.

Full particulars should accompany every specimen, such as:—Nature and extent of damage, time of its appearance, previous conditions of the plant attacked, the name of the plant, the locality and every fact that may be known of the pest in question. Great care should be taken to make the specimens fully representative of the insect and its work, and to ensure their arrival in good condition.

ELEMENTARY NOTES ON THE PROPAGATION OF PLANTS.

By C. Curtis, F. L. S.

Dame Nature's principal method of propagating plants is by means of seeds, but as she does not, as a rule, succeed in raising one ten-thousandth part of her progeny her methods cannot be blindly adopted by the planter or forester whose aim is to produce a large number of plants of a given kind in a short space of time.

In nurseries and places where large numbers of plants are produced for sale numerous methods, some of them exceedingly clever and known to but few, are adopted for multiplying what are termed difficult subjects. Fortunately the commercial products with which planters in this region are at present mainly concerned do not offer any special difficulties in the matter of propagation and therefore one or other of the means herein mentioned will generally meet the case.

The most general methods in use, and one or other of which succeeds with the majority of plants, are seeds, cuttings, grafts, buds, layers, division; and what for want of a better name is known as marcottage. The latter is what is generally spoken of here as grafting and is the method principally adopted by natives to increase any good variety of fruit or flower. It is both in principle and practice different from grafting and its main advantages are the production of fruit in less time than if grown from seed, and the certainty of perpetuating exactly what is desired. The latter is also one of the objects of grafting proper, but there are also other reasons for grafting one of the principal being to induce more vigorous growth by placing the graft on a stock with a better constitution or more adapted to the climate.

Seeds.

There are few kinds of trees or shrubs that do not at some time or other produce seeds, though it may not be until they have attained considerable age, and the intervals between the seed-bearing

seasons may be long. They are often unnoticed because of their small size and inconspicuous colours and consequently supposed not to be present. The size of the flower is no guide as to the size of the fruit or seed, small flowers often producing large fruits, and *vice versa*. The term fruit is here used in its botanical sense; one fruit may contain any number of seeds and may be of any size from that of a pin's point to that of a durian or jack fruit. As a rule, plants raised from seeds are of a superior constitution and less liable to disease than those propagated by any other method, but as a matter of convenience, and a means of saving time, other methods are sometimes adopted when seeds are just as easily obtainable. Seeds should always be selected from clean, healthy, vigorous plants, and in the case of plants that vary in any important matter, and there are few that do not, from the very best types obtainable. That they should be thoroughly ripe at the time of gathering is also important, for although imperfectly ripened seeds may germinate; they will not give such satisfactory results as those that have properly matured. Recent observation on this point in connection with gutta percha (Palaquium gutta) seeds, confirms this opinion. In this case great numbers of seeds were knocked off the trees by bats before they were quite ripe, but being anxious to raise a large number of plants, every seed was sown. A good number of these immature seeds germinated, but in many cases dwindled away and died in the course of a few weeks, while fully ripened seeds sown under exactly the same conditions, but separately, have grown well. The demand for para rubber seeds up to the present has been so great that seeds from any tree has readily found a buyer, but now that it has been proved beyond a doubt that there is a great difference in the yield of trees of the same age, growing side by side, under exactly the same conditions, preference should be given to seeds from trees that are known to yield freely. Personally, if I were forming a plantation, I should not hesitate to pay twice as much for seeds from proved trees as for those gathered indiscriminately.

To lay down a rule applicable to sowing all kinds of seeds is impossible, but the principal points to be observed, and which will prove successful in most cases, may be summed up in a few words. Drain well, cover lightly; water carefully; shade moderately. Use light sandy soil with a large proportion of leaf-mould for sowing seeds of most kinds no matter what the ultimate requirement of the plant may be. A smooth level surface, so that all the seeds may be of the same depth, and a covering of very fine soil not exceeding in thickness the diameter of the seed is generally sufficient. Under natural conditions seeds dropping from the trees get no covering at all but under such conditions only one in tens of thousands germinate except under the most favourable weather conditions, therefore it is not a system to be imitated. From observations made in regard to the natural reproduction of the more important local timber trees I have come to the conclusion that these bear seeds freely only at intervals of several years and that their chances of germination depends mainly on the state of

the weather during the period of ripening. Most of these tree seeds retain their vitality for only a short time and should the weather happen to be dry when they drop, and remain so for several days only a few plants come up, while on the other hand should there be frequent showers they come up in thousands though for want of light and space only a very small proportion survive.

CUTTINGS.

Next to propagation by means of seeds, cuttings is the most expeditious method, and the one most commonly adopted when the plant is amenable to this system. In some cases, however, it is difficult to get cuttings to grow and then in the absence of seeds, one or other of the processes to be mentioned hereafter must be resorted to. In the majority of cases trees and shrubs grow best from pieces of ripe or half-ripe wood which should be cut cleanly at a joint and in a slanting direction. Soft-wooded plants, such for instance as Coleus, Verbenas, &c. grow best from the points of soft tender growing shoots which should be inserted in a mixture of light soil containing a large proportion of fine sand. For trees and shrubs too there is, in a general way, nothing better to induce root formation than soil composed largely of leaf-mould and sand, though the amount of sand need not be so great as in the case of soft-wooded plants. Propagation from leaf cuttings can also in some cases be easily effected by inserting them in almost pure sand and not over watering them. Begonias, Gloxinias, Gesneras, and other plants of a similar nature, are amenable to this treatment. Attention to shading and watering are the main point to be observed in propagating from cuttings as well as from seeds.

GRAFTS.

Grafting is an ancient method of propagation, the history of which has been lost in the mists of antiquity. It is not as many seem to suppose a method by which new fruits or flowers are produced, but simply a means of multiplying existing forms, and in some cases of increasing their rate of growth or capability of producing flowers and fruit. In the case of some varieties of fruit trees the object of grafting is not to obtain more rapid growth but a greater abundance of fruit; consequently a slow growing kind of stock is selected on which to place the graft; in others more vigorous growth is the object aimed at, and then a vigorous quick growing stock is selected. There must, however, be a natural affinity between the two parts, the stock and the scion, though they need not necessarily be of the same species or even of the same genus. For instance, there would probably be no difficulty in grafting the cultivated forms of the Mango (Mangifera indica) on the "Bachang" (Mangifera foetida) or the nutmeg (Myristica fragrans) on Myristica Maingayii or any other of the many wild species common to this region. The range of possibilities is however, still wider than this, for in some cases complete unity is established when the scion and stock are of different genera. The limit is, however, bounded by the natural order, and it would be impossible to graft the Mango on the Mangosteen. There are many

methods of grafting but the aim is the same in all cases, and that is to effect complete unity between the two parts, scion and stock. The most common methods practised in England are known as whip, cleft, wedge, and saddle grafting, but in the East I have seen only one and that is grafting by approach, and which is also known as inarching. It is the most certain method and best suited for unskilled hands, and also I think for a climate which has no very decided seasons, but is a slow and tedious operation as compared to some of the others. The trouble and consequent slowness of this method is owing to the fact that the scion must be brought in contact with the stock and kept in that position until unity is effected before being severed from the parent plant, and in order to effect this it is necessary that the stocks be grown in pots or else planted quite close to the plant from which the graft is to be taken. This latter is practicable in the case of roses and largely practised in India, but in the case of fruit trees it involves not only growing the stocks in pots but an arrangement of staging and the labour of watering during a considerable period.

The mode of operation is to remove from one side of the stock a portion of the bark and wood, and from the scion a corresponding portion, as nearly as possible of the same size and shape. The two cut surfaces are then placed in contact and tightly bandaged. When these have united the scion is severed from the parent tree at a point a little below the tie and henceforth draws its nourishment from the stock. By all the other methods mentioned the scion is completely severed from the parent tree in the first instance and transferred direct to the stock and fitted according to one or other of the processes referred to as whip, saddle &c. After being carefully tied in position, air and moisture is excluded by a coating of clay or grafting wax. In a few experiment made here with these methods the results have not been encouraging and I therefore advise the inexperienced to stick to the grafting by approach method which though comparatiely slow and tedious is sure.

Buds.

The object of budding is much the same as grafting and both methods are sometimes used for the same kind of plant; the latter being performed generally in the early spring when the sap is rising, and the former towards the end of summer, but while the sap is still running freely. Unless the latter condition prevails so that the bark separates freely from the wood, budding cannot be successfully performed. One advantage of budding over grafting is that in case of necessity every eye can be utilised and more plants of a given kind produced from a limited number of shoots. As in grafting, there is more than one way of budding but the most general and satisfactory is that termed **T**-budding, or Shield-budding. To explain this to the uninitiated without illustrations is a little difficult but the process is the insertion of a single eye, from the plant it is desired to propagate, between the bark and the wood of the one it is intended to use as a stock, and when it has "taken" to cut back the branch or stem of the stock on which

it has been inserted to a point slightly above the bud so as to cause it to "break" and form the future tree. Under favourable conditions it is a very simple process.

A **T**-shaped incision is made in the bark of the stock the cross cut or head of the **T** being either at the top or the bottom. If at the bottom it is then termed inverted shield budding and the bud is pushed into position upwards instead of downwards, the eye or bud of course pointing upwards in either case. With a sharp knife a single bud is cut from a young branch of the tree it is intended to propagate with a portion of the wood attached, the latter being generally removed before the bud is inserted in the **T**-shaped incision in the stock. It is then carefully bandaged with some soft string and the operation is complete. The important conditions necessary to success are that the wood that attaches to the bud when cut separates easily from the bark, and that the bark of the stock is easily raised for the insertion of the bud. A special knife with a thin bone or ivory handle is necessary for this work.

LAYERS.

Layering is a method of propagation that succeeds in many cases when other means fail and is best adopted to plants having shoots near the ground. It consists of laying down the branch of the plant, to be increased, in the soil, and pegging it firmly in position until roots are emitted, and then separating it from the parent. To induce or hasten the production of roots the branch is generally cut, twisted, or in some manner fractured, at the point where it is desired to produce roots. A mixture of light sandy soil is also placed at the same point to encourage the production of roots which may appear in a few days or after the lapse of some months, the period depending entirely on the nature of the plant.

DIVISION.

To such plants as it is adapted, root division is an effectual and rapid way of multiplication. In most cases it is advisable to lift the whole plant to be propagated entirely out of the ground and divide it first in half, and to continue halving these portions again until the most that is possible has been made out of them, or the desired number of plants obtained. By this means better rooted pieces are obtained than by breaking away small bits from the outside. "Ramie" (Boehmeria nivea), and the common hedge bamboos, (bambusa nana), also cannas, are examples of plants best propagated by division. In cases where it is desired to leave the main portion of the plant intact portions may be removed from the sides without lifting the whole, but if the object is to propagate as many as possible the method above indicated is the best. As each piece should have more or less roots, with ordinary care and favourable weather, almost every one should grow. The best time for performing the operation is at the beginning of the rains if that period can be ascertained but in this region the seasons are not well defined and practically it may be done at any time provided attention is paid to watering and shading until new roots commence to form. In Penang the greatest rainfall is from May to

October and it is during those months that propagating and planting can be performed most successfully and with least trouble.

Marcottage.

Marcottage is the most commonly practised system of propagation adopted by Chinese and other Asiatics in this Colony for increasing and perpetuating choice varieties of fruits and flowers. It is also largely adopted by European planters for obtaining plants of "gutta rambong" (Ficus elastica) the saving in time as compared to raising them from seeds being considerable. The way in which this is generally done is to remove a narrow strip of bark at the point where it is wished to obtain roots and to wrap around the spot a quantity of clay, coco-nut fibre, moss, or some other material that can be kept moist until roots are emitted. There is, however, a variation of this method, and one specially adopted for quickly rooting "rambong", and that is, instead of removing a strip of bark to cut the shoot nearly half through drawing the knife in an upward direction for about an inch or an inch and a-half and to put some damp clay inside and around the cut covering the whole with coco-nut fibre. By this means roots are very quickly produced provided the bandage is never allowed to get dry. Some kinds of plants will root in the course of ten days or a fortnight while others take months. The principal point to be observed is never to let the material that forms the bandage get dry.

New method of propagating Gutta Percha Trees.

A new and decidedly clever way of propagating Gutta Percha trees, (Palaquium sp.) and which does not exactly come under any of the previously described methods, the credit of which is due to Mr. Burchard, a planter in Sumatra, consists in laying down in a horizontal position young saplings the size of a lead pencil, or a little larger, until they make shoots at right angles to the stem three or four inches in length. The stem is then cut clean through at a distance of about one and a-half inches on either side of the shoot and the cutting inserted in clayey soil and placed in a damp cool place until rooted. Gutta Percha trees are exceedingly difficult to propagate by any means except seeds and these are difficult to get. In fact this is the only practical way I know of and we have tried thousands of cuttings in various ways. Unfortunately its application on a large scale depends on a supply of small saplings which are only obtainable in places where formerly there were seed-bearing trees and where the saplings have remained suppressed under the shade of other trees.

VITALITY OF SEEDS.

Sir W. T. Thiselton-Dyer and Professor Dewar have shown us that the vitality of protoplasm is not impaired by the almost inconceivably low temperature of liquid hydrogen. Dr. Henry Dixon, of Trinity College, Dublin, has recently been experimenting in the

opposite direction, and in Nature for July 11th he narrates the results of some experiments that he made with dried seeds, from which he concludes that in every case they can resist surprisingly high temperatures. For instance in Medicago, 10 per cent. of the seeds germinated after an exposure of one hour to 110° C = 262° F. and then to another hour to 121° C = 281° F. The effect of exposure to high temperature is, however, noticeable by the extremely slow growth afterwards. Seeds that resist, as many do, the action of poisonous vapours owe their immunity, not to the quiescence or power of resistance of the protoplasm, but to the imperviousness of the seed-coat, for if this be punctured before the seeds are exposed to poisonous vapours or liquids, then the pernicious effect of the poisons is rendered evident, as the seeds do not germinate.

The Queensland Agricultural Journal for May has the following interesting Article on "Foxy Coffee", a condition which denotes the adhesion of the silver skin to the seed, and into which the colouring matter contained in the outer skin and fruity portion of the cherry has infiltrated. It is said that the quality of the Coffee is not injured thereby.

TROPICAL INDUSTRIES—FOXY COFFEE.

In our last issue we published a most interesting article on "Foxiness in Coffee", by Mr. H. NEWPORT, Instructor in Coffee Culture for this State. The following article on the same subject appeared in a late number of the Tropical Agriculturist, Ceylon, and fully endorses the remarks of Mr. NEWPORT. The article is addressed to the Editor of the Planting Opinion, and reads as follows:—

TO EDITOR PLANTING OPINION:

Sir,—With reference to Mr. P. G. TIPPING'S query *re* "Foxy Coffee" in your impression of the 5th instant, I think he will find the following information of some use. Speaking on the subject at the U. P. A. S. I. meeting in 1899, Mr. GRAHAM ANDERSON, C. I. E., said: This term "foxy" denotes a reddy-brown appearance of the seed caused by the adhesion of the silver skin into which the colouring matter contained in the outer skin and fruity portion of the cherry has infiltrated. This appearance is undoubted evidence of the fruit having been picked when quite ripe, and nearly all really good, cherry-dried coffee, which is so highly esteemed in France, is thus indelibly marked. The quality of the coffee is in no way injured, the stain being superficial and confined to the silver skin, which can easily be scraped off with a penknife. If roasted carefully, the aroma will be found excellent, which is another proof of maturity. If a quantity of ripe coffee fruit is heaped or kept in a cistern, fermentation will take place, and the red colouring of the skin and fruity portions will sink into the gummy substance surrounding the "parchment" precisely in

the same way that analine ink penetrates the gelatine slab used for copying letters. If prompt measures are not adopted, not only will the parchment be permanently discoloured but the silver skin below will be stained and firmly gummed on to the seed. If observed in time, the remedy consists of getting the fruit pulped as soon as possible, in closely watching the subsequent fermentation, and having the parchment thoroughly washed as soon as the gum has changed into a state in which it can be acted upon by water. In warm, rainy weather similar changes occur in very ripe cherry before it is picked from the trees. Some pulpers do not work satisfactorily and allow a large quantity of skins and half-pulped cherry to pass into the cistern along with the parchment. If these are not properly separated before fermentation takes place, the seeds they contain will be more or less foxy. The ripest, richest, and most succulent fruit is always the first to suffer in this way, or from any delay occuring in "picking, pulping, or preparation."

Last season, in his desire to enhance the quality of his coffee, a proprietor hereabouts allowed his coffee to get dead, or purple, ripe on the trees before picking it, and, to his thundering surprise, it was reported on from the coast as foxy. Now, his coffee had never before been reported as foxy. His surprise was even greater when he was told that the "foxiness" had probably been produced by his allowing the fruit to become over-ripe on the trees before gathering it. On the other hand, on a neighbouring estate, the coffee, which had previously to last season been nearly always pronounced foxy, was that season singularly free of "foxiness". This was attributed to a uniformity of shade over the place which seems to have been attained for the first time in 1898-99, but the "trick" seems to have been done by washing the coffee twelve hours after pulping it, the pulphouse having a position facing southwest, and the aspect of the estate being throughout nearly the same. The obvious precautions which suggest themselves from the foregoing are—

(1) To avoid, as far as possible, allowing the berries to become dead, or purple, ripe on the trees. They should be picked as uniformly red-ripe as possible. A spot of green on the outside pulp will make no difference, the bean being nearly always matured before the pericarp has been fully coloured.

(2) To pulp the coffee as soon after taking in as possible. The operations of pulping and measuring might go on simultaneously. Some power more expeditious than cattle-power is desirable in this connection.

(3) To pulp as cleanly as possible. If pulpers are not working satisfactorily, this must be done with the aid of a sieve, the skins and half-pulped cherry being passed through the pulpers a second time.

(4) To wash the coffee as soon the mucilage is ready to be acted on by water. This can be determined by experiment. For the rest, trust in Providence. I trust that this small contribution on the question will promote a

healthy discussion which will lead to the elucidation of a subject which there is no gainsaying is of great importance to the planting industry.

DISEASED ROOTS OF PARA RUBBER TREES FROM SINGAPORE.

During my recent visit to Selangor I was shewn round one of the leading Coffee and Para Rubber Estates, and I admired as no one could help admiring the splendid Coffee and Rubber trees, and the admirable way the estate was evidently managed. The one drawback, however, was the white ant pest, and it was truly grievous to see fine four year old Para Rubber trees killed by their attacks. At my request the manager was good enough to have several trees that were attacked pulled up. So that we could examine the roots. My object in doing so was twofold, first I wanted to see the kind of termite, but the chief reason was to look out for fungus, for I suspected that white ants were not alone the cause, nor was I wrong in my surmise for I succeeded in finding a fungus as I had suspected. Now I am aware I am on debateable ground, I mean as to whether the particular tree I examined which had fungus on its roots, was killed by that fungus, or by white ants or by both, and I shall be glad if it provokes discussion and cause planters to observe carefully and give their opinion in the Bulletin. My own theory is that in this particular instance the fungus was the cause. At any rate there can be no doubt of the deadly nature of the fungus which proved to be a species of *Helicobasidium* probably H. mompa. as determined by Mr. Massee of Kew, who writes as follows:—

The roots are attacked by a fungus belonging to the genus *Helicobasidium,* which appears to be very closely allied to, if not identical with *H. mompa,* a fungus very destructive to the mulberry tree in Japan. The specimens sent are sterile, hence the species cannot be determined with certainty.

The fungus travels from one tree to another by means of cordlike mycelium spreading in the soil.

The various methods for dealing with root-parasites of fungus origin are given in "Kew Bulletin" 1896, p. 1.

Preventive Measures.

Owing to the habit of the fungus in penetrating and spreading in the living tissues of the root of its victim, cure is practically outside the question when a plant is once permeated with mycelium; and keeping in view the varied modes of reproduction for facilitating the rapid spread of the disease, no efforts should be spared in the way of preventing such spreading, when the presence of the fungus is once detected.

Undoubtedly the most frequent and rapid mode of spreading is by means of the mycelium travelling in the soil, and a good method of isolating diseased patches is to cut a narrow trench, from nine inches to a foot deep round such, care being taken to throw the

excavated soil into the diseased portion, and not outside it. This method, which was first suggested by Hartig, for the purpose of preventing the spread of subterranean fungi in the german forests, cannot be too strongly commended, especially where the diseased patches are small in area. The amount of success depends entirely on the thoroughness, combined with an intelligent me'hod of carrying out the work. Half attempts invariably result in a loss of capital without benefit. It may be enough to suggest that the disease may be spread by the spores of the fungus, or infected soil being carried by the shoes of labourers, by dirty tools, wheels of carts, animals, &c. from diseased centres. Diseased and fallen trees, and especially stumps and roots, should be at once destroyed by burning. The soil surrounding diseased stumps should be burned after the stumps have been removed, so as to destroy the smaller diseased portions of the root that remained behind.

A second preventive method, which has proved of service in France, is to lay bare the trunk as far below the surface of the soil as can be done without injury to the tree, and to densely coat the exposed trunk and adjoining soil with powdered sulphur. This should be repeated, when the channel round the trunk becomes filled up with earth. If, as stated by Mr. Wight, the New Zealand fungus first attacks the trunk just below the surface of the soil, this method should prove beneficial if preserved with.

Stagnant water should not be allowed to remain in the soil, as this favours the spread of the fungus.

Finally, in those cases where the fungus has completely devastated large areas, it is probable that such will be deserted as unprofitable the trees being allowed to lie and rot, and the fungus to spread in the soil. This is disastrous, being in fact a nursery for the development and diffusion of the enemy.

It is not the object of this note to suggest whose business it is to prevent such shortsightedness, but to impress emphatically that such a condition of things should not be tolerated.

GEO. MASSEE.

NOTES.

RUBBER PLANTING IN PENANG.

When such a usually conservative people as Chinese squatters voluntarily take up the planting of Para Rubber, it shows how deeply the idea that the cultivation of Para Rubber will give a handsome return, has taken root. As an alternative to planting spices the Chinese in Balik Pulau, Penang, under the fostering care of their District Office, Mr. Hereford, are planting Para Rubber; a few thousand seeds having been supplied them for the purpose. Should these trees eventually yield latex as freely as the one in the Botanic Gardens there, the Chinese will have no cause to regret their substitution of nutmeg for Rubber cultivation.

German Colonial Enterprise.

Our Teutonic friends are shewing signs of great activity in introducing into their colonies plants and seeds of the chief trees which give produce of economic value. Dr. Stuhlmann has been making a tour of the various tropical countries, English and Dutch, to study the cultivation of the various products—such as Cinchona, Rubber, Gutta, Indigo, Gambier, etc., with a view to their introduction into German Africa. Mr. R. Schlechter has also under the auspices of the Kolonial-Wirtschaftlichen Komitees been specially deputed to the East to study the Gutta Percha and Rubber question, etc. After some six months enquiry, during which time he visited Java, Borneo, Sumatra, etc. He left Singapore at the end of September for German New Guinea, taking with him fifty-five cases of Gutta Taban. Thirty-four cases of Gutta Sundik, (Payenia Leerii), besides lesser quantities of Castilloas. Heveas, Rambong, Willughbeias, Ramie, Manila hemp, Patchouli, Nutmegs, etc. It remains to be seen how far the climate of New Guinea will suit these various plants ; in any case, however, it shews how earnestly they have entered the field of commercial activity.

The Philippines and the Cultivation of Gutta Percha.

The Americans too, are fully alive of the importance to the world of Gutta Percha and are endeavouring to find out, first, what species of indigenous guttas are found in the Philippines and whether they are worth cultivation, and secondly whether the introduction of D. Gutta, and others is likely to be a success. For this purpose Dr. Sherman of the Forest Bureau, Manila, spent some months in the Straits and Java studying the question. During his researches he has found out how necessary it is to have recourse to chemical analysis as the only means of determining the commercial value of any particular kind; as there are so many varieties of Gutta trees whose general appearance resemble each other but that give latex in various qualities. Roughly speaking D. Gutta, or oblongifolia and D. borneensis are practically the same in yield and are to be regarded as the best, whereas D. Treubii and several others are much inferior in the richness of their latex. The flow of latex may be as copious as in the best kinds but the high percentage of resin and correspondingly low percentage of Gutta renders them very inferior. There is yet, however, a great deal to be done both botanically and chemically in determining the different species and ascertaining their value as gutta producers. I note that the best quality of gutta was sold last month at $600 per picul.

Gutta Percha in French Indo-China.

The Government in French Indo-China is patronising the cultivation of the gutta percha tree, and planting is now being tried in various parts, chiefly in Laos, also in Annam and Tonkin. Exports for 1900 amounted to 339,000 kilos against 52,813 kilos in 1899. A picul of good quality is worth about 130 dollars. (£13.)

Rubber Preparation.

A Trinidad note remarks :—In pursuing experiments with the view of ascertaining the most economical method of coagulating rubber fluids, some of these were allowed to stand forgotten in a large receptacle where they had been creamed. When again handled the whole mass was putrid, but the rubber was still on the surface and easily coagulated or "coalesced" on being handled, and the quality produced is stronger and therefore of a higher quality, than rubber prepared in other ways. The specimen was shown to a noted American manufacturer of rubber goods who readily recognised its quality from among numerous other specimens. There were, however, evident signs of loss of weight in rubber material by the decomposition set up by the fermentation of the proteids.

Proposed Extension of the Bandong Quinine Factory.

Since the introduction of the co-operative working arrangement between the Bandong Quinine-works and the Java Cinchona Planters, the factory has been fully employed, and is now even working day and night to keep pace with the deliveries of bark. The total quantity of bark worked up in one year comes to about 30,000 to 40,000 tons, and is equal to about one-eighth or one-tenth of the total annual production of Java, the remaining seven-eighths being exported and sold to the European Quinine factories. The low grade bark, which, as a rule, was not exported, is now also worked up with advantage, as contracts have recently been made with American firms for the sale of such by-products of the quinine industry as cinchonine and cinchonidine.

It is said that the opinion prevails in Europe that if about three-quarters of the annual production of Java bark is exported to Europe, and the remaining quarter manufactured into quinine in Java, the situation would be satisfactory to all parties concerned. But in view of the growing output of other countries, and notably the increasing production of high-grade bark in British India, and the possibility that this may ultimately have an unfavourable effect on the quinine market, it is advocated in Java that a large proportion of the bark grown there should be worked up in that country. With this view, it is recommended than the works of the Bandong Company should be extended by the erection of a second factory, and that the required capital, which is estimated at about £20,000 should, at least in part, be subscribed by the Java planters. It is further considered essential for the success of the undertaking that the cinchona planters who agree to send their output to the new factory should undertake to continue to do this for a period of not less than five years.

MARKET AND TRADE REPORTS.

Compiled from statistics supplied from the Singapore Exchange.

September, 1901.

	Tons sold.	Highest for the month.	Lowest for the month.
		$	$
Coffee—Palembang	75	28.00	24.50
Bali	50	23.50	19.75
Liberian	367	17.35	16.50
Copra	2,988	9.15	7.67½
Gambier	3,323	11.75	10.75
Cube Gambier, Nos. 1 & 2	195	15.50	13.25
Gutta Percha, 1st quality	...	600.00	475.00
Medium	...	450.00	300.00
Lower	...	200.00	50.00
Borneo Rubber,	...	125.00	73.00
Gutta Jelotong	...	7.50	6.90
Nutmegs, No. 110's	...	50.00	48.00
No. 80's	...	66.00	66.00
Mace, Banda	...	95.00	84.00
Amboyna	...	68.00	66.00
Pepper, Black	326	30.50	30.00
White	470	46.25	43.50
Pearl Sago, Fair	260	4.40	3.95
Medium	...	5.00	4.40
Large	20	6.00	5.40
Sago Flour, No. 1	3,470	3.57½	3.20
No. 2	240	3.15	1.80
Flake Tapioca, Small	855	8.50	5.00
Medium	68	6.00	5.25
Pearl Tapioca, Small	360	6.70	5.00
Medium	941	7.80	5.25
Bullet	...	7.15	5.90
Tin	2,680	68.25	66.12½

LONDON MARKETS.

From the Chemist and Druggist.—September 21st, 1901.

Areca.—The bulk of the London stock is reported to be in first hands, and 17*s.* per cwt. appears to be the lowest price asked.

Arrowroot.—In auction 18 half-barrels Bermuda were bought in at 1*s.* 6*d.* per lb. No St. Vincent was catalogued, but privately there has been a good business at 1⅜*d.* per lb.

Benzoin.—Since the auctions a considerable business has been done in Sumatra gum, amounting to about 80 cases at between £6 and £8 per cwt. Gum at from £9 to £12 is scarce and

much wanted. Siam is slow of sale, being held for high figures. The first-hand supplies of good Palembang gum have been practically cleared, and only medium and low qualities are left at about 40*s.*

Camphor.—A quiet market is reported for crude, but for arrival the Japanese quotation is higher at 152*s.* 6*d.* per cwt., c.i.f. At the close of last week business was done at 145*s.*. c.i.f. for October-November shipment.

Cascara Sagrada.—Old bark is quoted 28*s.* per cwt., c.i.f. to arrive.

Cinchona.—The shipments from Java for the first half of the month were 600,000 Amst. lbs. against 610,000 Amst. lbs. last year.

Cloves.—Zanzibar are selling on the spot at from $3\frac{13}{16}d.$ to $3\frac{7}{8}d.$ per lb. according to quality. For delivery prices are weaker, October-December delivery having sold at $3\frac{9}{16}d.$ to $3\frac{5}{8}d.$ and January-March at $3\frac{9}{16}d.$

Cocaine.—The S. S. *Orinoco* has arrived from Callao with 13 packages crude cocaine.

Cocoa Butter.—On October 1st, at Amsterdam, 80 tons Van Houten's brand, 5 tons de Jong, 1 ton Helm, and 5 tons Mignon will be offered, and on the same date here 50 tons Cadbury's brand.

Cubebs.—The exports from Singapore, from January 1st to August 19th, have been 101 piculs to the United Kingdom, and 2,325 piculs to the United States of America.

Dragon's Blood.—The exports from Singapore from January 1st to August 19th, amounts to 72 piculs, shipped to this country. The S. S. *Shanghai* has arrived from Singapore with 10 cases and 2 cases from Penang.

Gamboge.—The shipments from Singapore, from January 1st to August 19th, have been 64 piculs to U. S. A. and 13 piculs to the U. K.

Ginger.—Jamaica was represented by 17 barrels only, in the sale of which 5 sold at 36*s.* 6*d.* for fair but slightly wormy; 220 bags Cochin were bought in at from 38*s.* to 42*s.* 6*d.*, the latter figure being for good washed rough.

Ipecacuanha.—It is reported that the Government of Colombia has placed an export tax of 1*s.* 6*d.* per lb. on Cartagena Ipecacuanha, apparently with the view of raising revenue to carry on the Civil war. In our issue of August 11th, 1900, page 297, we reported that duties had been placed on certain produce exported from Colombia, including rubber, coffee, gums, &c. so that this tax on Ipecacuanha is quite feasible and probable. On the London market business has been done at 6*s.* per lb., for good clean root, and 6*s.* 6*d.* is now wanted. Rio is unchanged, with small sales at 11*s.* 3*d.*

Kola.—At the spice auctions 10 packages of West Indian were offered of which 7 sold at from 2*d.* to 7*d.* per lb.

Mace.—Steady. In auction 49 packages West Indian, offered and sold, good pale at 1*s.* 6*d.*, fair ditto 1*s.* 4*d.* to 1*s.* 5*d.*, and

ordinary 1*s*. 2*d*. to 1*s*. 3*d*. per lb. Of 14 cases Penang offered 2 sold at 1*s*. 10*d*. for good red, slightly wormy. Nine cases Singapore were bought in.

Oil, Lemon Grass.—From second-hands $4\frac{7}{8}d.$ to 5*d*. per oz. c.i.f., is quoted, and 6*d*. on the spot.

Oil, Peppermint.—The spot price of Japanese dementholised oil has advanced to 4*s*. per lb., and this figure has been paid. The arrival quotation is unchanged at 3*s*. 6*d*., c.i.f., for August-October shipment; 40 per cent. oil has also advanced to 7*s*. 3*d*. and very little can be had; American H G H is still 8*s*. 3*d*. to 8*s*. 6*d*. spot from first-hands; and 7*s*. 9*d*. in second hands. Tin oil is quoted 6*s*. 6*d*. spot for finest.

Pepper.—In auction 170 bags fair Alleppy were bought in at $6\frac{1}{4}d.$ per lb. Neither black nor white Singapore was offered. Privately the market for white Singapore is firm, but quiet, at $9\frac{1}{16}d.$ for distant shipment, and Penang $8\frac{5}{8}d.$ nominally. Black Singapore is also firm, with buyers on the spot at $6\frac{1}{8}d.$ and sellers $6\frac{3}{16}d.$

Pimento.—Quiet. In auction, of 430 bags offered 100 sold at $2\frac{7}{8}d.$ per lb. for fair.

Quinine.—The market last week closed fairly active, good brands of German sulphate in bulk changing hands for October delivery at 1s. $1\frac{1}{8}d.$ and 1s. $1\frac{3}{8}d.$ for December, but on Monday, when it was found the bark shipments from Java for the first half of the month were heavier than had been expected, the market opened flat and declined quite $\frac{1}{2}d.$, October selling at 1*s*. $0\frac{1}{2}d.$ and December at 1*s*. 1*d*. Subsequently the market became firmer, with small sales of October at 1*s*. $0\frac{3}{4}d.$ to 1*s*. 1*d*. and December at 1*s*. $1\frac{1}{8}d.$ to 1*s*. $1\frac{1}{4}d.$, and the market closes at the outside figures. Imperial brand is quoted 1*s*. $0\frac{7}{8}d.$ spot, and 1*s*. $1\frac{1}{2}d.$ forward.

Vanilla.—Arrangements for a mail-service between Marseilles and Seychelles have been concluded with the Messageries Maritimes Company. The first steamer left Marseilles on August 25th.

The weather.

The Rainfall during September was on the whole fairly equable, except in Singapore which was under the average and which caused a curtailment of the supply to the town for a short time. The total fall was 6.73 inches. Penang had the greatest fall which measured 14.77 inches. Malacca exceeded the average slightly with a total fall of 11.65. Perak varied greatly. The greatest total fall being registered at Selama which was 13.21, the lowest falling at Ipoh which was 3.08 inches only. Selangor too shewed difference from 9.91 which fell at the District Hospital, Kuala Lumpur to 1.81 which was the record from Kuala Selangor. Pahang gave fairly equable returns from all stations.

Singapore.

Abstract of Meteorological Readings for September, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29.912	137.8	80.1	86.3	73.7	12.6	77.3	.872	75.2	81	SSE. SE.	6.73	1.34

K. K. Hospital Observatory,
Singapore, 14th Otocber, 1901,

A. B. LEICESTER.

Assistant Surgeon and
Meteorological Observer.

Penang.

Abstract of Meteorological Readings for September, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	1%		ins.	ins.
Prison Observatory ...	29.876.	145.9	81.87	89.7	73.3	16.4	74.4	.734	69.33	72	South.	14.77	2.66

G. D. FREER,
Colonial Surgeon, Penang.

Penang, 8th October, 1901.

Malacca.

Abstract of Meteorological Readings for September, 1901.

	Mean Barometrical Pressure at 30° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulk.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital.	29.862	148.5	82.3	88.3	68.5	19.8	80.7	1.034	Not Registered.	92.	S.	11.65	2.40

Malacca, 8th October, 1901.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for September, 1901.

District.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	158.	82.10	93.	70.50	22.50	76.49	841	77	6.24	.86
Kuala Kangsar ...	...	80.08	92.	71.	21.	76.07	845	82	7.22	1.66
Batu Gajah ...	159.	81.30	93.	72.	21.	77.14	877	83	6.91	2.28
Gopeng ...	...	8. 3	93.	66.	27.	75.53	817	78	7.57	1.26
Ipoh ...	...	80.45	92.	71.	21.	76.63	867	84	3.08	.60
Kampar ...	...	...	92.	70.	22.	...	...	...	8.03	3.03
Telok Anson ...	...	81.01	92.	72.	20.	76.84	867	82	6.40	1.80
Tapah ...	..	80.63	92.	70.	22.	76.29	848	81	8.38	1.74
Parit Buntar ...	...	81.61	92.	71.	21.	77.17	872	81	11.45	3.60
Bagan Serai ...	...	81.24	91.	71.	20.	77.49	894	84	7.78	1.63
Selama ...	...	80.95	91.	71.	20.	76.86	870	83	13.21	2.46

Taiping, 11th October, 1901.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State for September, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29.810	144.4	81.2	90.0	72.4	17.6	76.7	0.833	73.7	78	Calm	8.83	2.22
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	8.94	2.06
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	9.91	1.83
,, Klang	...	...	...	86.4	74.0	12.0	...	...	...	...	...	5.72	0.79
,, Kuala Langat	...	...	...	84.4	73.0	11.4	...	...	...	...	...	5.05	1.70
,, Kajang	...	...	...	85.2	75.4	9.8	...	...	...	...	...	3.52	0.78
,, Kuala Selangor	...	...	...	86.2	75.4	10.8	...	...	...	...	...	1.81	0.52
,, Kuala Kubu	...	...	...	91.0	72.2	18.8	...	...	...	...	...	5.95	1.06
,, Serendah	...	...	...	89.8	76.5	13.3	...	...	...	...	...	9.38	2.32
,, Rawang	...	...	...	85.9	73.5	12.4	...	...	...	...	...	7.32	1.87
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	2.74	0.74

State Surgeon's Office,
Kuala Lumpur, 15th October, 1901.

A. J. McCLOSKY,
Acting State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State for September, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maxium in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan (Dist. Hospital)	...	...	...	92.	71.	16.3	...	...	...	...	...	10.41	2.25
Kuala Lipis - -	...	...	...	93.5	70.0	19.6	...	...	...	...	...	8.40	1.58
Raub - -	...	...	...	92.0	69.0	17.53	...	...	...	...	...	8.68	1.82
Bentong - -	...	...	...	92.0	66.0	22.0	...	...	...	...	...	9.22	1.85
Temerloh - -	...	...	...	92.	72.	29.	...	...	...	...	...	6.68	1.28

STATE SURGEON'S OFFICE,
Kuala Lipis, 1901.

E. F. Townley,
D. H. McClosky,
P. Gerrard, M. D.
} *Actg. Residency Surgeons.*

No. 3.] DECEMBER, 1901. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

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AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

No. 3.] DECEMBER, 1901. [VOL. I.

THE TIMBERS OF THE MALAY PENINSULA.

Continued.

LINEÆ.

Erythroxylum burmanicum, Griff. Medang Lagundi, Chintah Mulah.

A common tree in sandy spots near the coast, usually about 20 or 30 feet tall but attaining a great height, rather bushy with small dark green leaves. Flowers small greenish, fruit a small red drupe. Bark wrinkled, fissured and corky, grey, wood heavy and compact dark red or brown with distinct but irregular rings, rays very fine and numerous, pores copious and small. Weight 57 lbs. It gives a good ordinary building timber, though not often very large, but beams squaring 5 or 6 inches can be obtained.

Ixonanthes icosandra, Jack. Pagar Anak.

A straight tree 50 or 60 feet tall with coriaceous leaves, cymes of green flowers, on long peduncles and capsular fruit with winged seeds. Common in woods all over the Peninsula. Bark thin $\frac{1}{8}$ inch thick, sapwood scanty, heartwood pale brown to reddish brown, heavy and fairly hard, rings fairly distinct narrow and irregular, rays very numerous close and fine, pores very numerous and small, in short irregular lines, concentric lines fine wavy broken up. A good building wood, but is apt to split in drying. Beams 5 to 6 inches square can be obtained.

Weight 59 lbs. $7\frac{1}{4}$ ozs., 55 lbs. 6 ozs. (Maingay) ; Singapore 54 lbs.

I. reticulata, Jack. Jinjagong (Maingay).

An equally large tree with rounder leaves and much larger capsules, occurs in woods usually at a higher elevation, up to 3,000 feet. The wood is fairly heavy, white (brownish olive or dirty) white with brownish striæ. (Maingay), pores rather large.

Good for building. Weight 42 lbs. $10\frac{1}{4}$ ozs. to 48 lbs. 4 ozs. (Maingay), common in the low country and also on the hills to 3,000 feet altitude, Singapore to Kedah.

Roucheria Griffithiana, Planck. Akar Ipoh Putih.

A stout climber about 3 inches thick with light coloured bark.

Wood dark brown when dry with very large pores, rays distant obscure, soft and little use, weight 33 lbs., (Maingay); Singapore 41 lbs. 2 ozs.

Common in the low country.

RUTACEÆ.

Clausena excavata, Burm. Cherik Kitam.

A small tree with aromatic pinnate leaves, panicles of small green flowers and oblong pink semitransparent fruits. Common near villages perhaps introduced here, the leaves being eaten by Klings. Usually about 15 to 20 feet tall and 3 inches through with thin smooth dark brown bark. Wood white with very fine and close rays, rings distinct but fine and close with broader and more distant ones at intervals, pores medium very numerous and close. Weight 39 lbs. 10 ozs.

Though this is too small for most work it might be used for small cabinet work as it is of a good white colour.

Murraya exotica, L. Kamuning.

A small much branched tree with sweet white flowers and orange or red fruits, cultivated in many places. Wood fairly heavy, not hard, yellow often beautifully mottled with brown. It takes a good polish.

A well known ornamental wood used for sheaths and handles of krises, walking sticks, etc. Twisted roots are sought by the Malays for kris handles.

Citrus decumana, Willd. Pumelo. Limau abong.

The well known fruit tree. The wood is moderately heavy, white becoming brownish, rings distinct, rays numerous fairly thick, pores small few, numerous transverse broken up bars of softer tissue. Weight 48 lbs. 6 ozs.

C. aurantium, L. Orange, Limau Manis.

The wood of this much resembles that of the pumelo, but appears to be rather softer as a rule.

C. medica, var. Catinga (Siamese.)

A wild variety of the Citron, with large warted fruit with a thick rind and a very little bitter pulp, occurs in Siamese territory north of Province Wellesley. It produces a remarkably beautiful yellowish fawn timber variegated by dark brown streaks which makes very beautiful furniture and is much sought for for Kris sheaths, etc. Weight 67 lbs. 8 ozs.

Acronychia laurifolia, Bl. "Babi Kurus" (Penang) Mentua Keminiyan.

A medium-sized tree about 20 to 40 feet tall with greenish flowers and fruits something like small limes, aromatic. The wood is yellowish white, closer and heavier than that of *Clausena* which

it somewhat resembles, rays fine but rather distant, pores fairly large. Weight 49 lbs. 8 ozs.

The wood is too soft to be of much use. It is said to be aromatic when burnt.

A. Porteri, Hook, fil. Pao-pao.

A tree about 30 to 80 feet, somewhat similar to the last, is used in building but is not durable.

Evodia glabra, Bl.

A fairly tall tree with trifoliate leaves and corymbs of white flowers. Wood soft white, not heavy, pores rather large, rays irregular. Bark thin. Weight (S.) 20 lbs. 2 ozs. A common tree in woods.

E. Roxburghiana. Benth. S'tengah Burong.

A bush, hardly a tree. Maingay describes the wood as "reddish white, abundantly blotched with elongated patches of dull red or brown grain coarse, does not split in drying. Weight 28 lbs. 8 ozs." (Maingay), 51 lbs. (Gamble).

Used for planking (Veth).

OCHNACEÆ.

Gomphia Sumatrana, Jack.

A medium-sized tree with yellow flowers. Bark grey but fairly smooth yellow inside thin $\frac{1}{16}$ inch dark brown in section. Wood hard and heavy, pale brown to dark reddish brown with distinct irregular rings, pores very small numerous, rays fine and very fine mixed. A hard strong wood with wavy fibres rather apt to split. "Used for the manufacture of boats, pumps and blocks" (Maingay). Weight 53 lbs. 14¼ ozs. (Maingay), (S.) 55 lbs. 2 ozs.

G. Hookeri, Planch. Tampoi paya.

A small tree with narrow lanceolate leaves and deep red flowers. Common on the sea coasts in sandy spots. Wood very close grained brown, much resembling that of *Erythroxylon burmanicum*, rings obscure, pores numerous close, rays very fine.

Weight 60 lbs.

BURSERACEÆ.

Trees of moderate size, seldom very large, some produce a resin, and that of Triomma Malaccensis is very aromatic and dark coloured. The fruits of some of the Canariums are pickled, and the kernels of others eaten like walnuts.

Canarium nitidum, A. W. Benn.

Medium-sized tree, wood light brown in transverse section grey, rays brown very irregular in size not numerous, pores medium in size scanty. Weight 13 lbs. 1 oz. Common in Singapore, Malacca and Perak.

C. secundum, Benn. Kasambi Kasamba.

Wood light red with rather large pores and scattered rays, rings not very distinct, fibres wavy, grain medium hard splits slightly in

drying, used for blocks, for boat rigging, etc. Weight 51 lbs. $1\frac{3}{4}$ ozs. (Maingay) a fairly common tree.

C. Kadondon, Benn. Kadondong Hutan.

Wood dull white becoming reddish white internally, grain very coarse soft splits slightly. Weight 30 lbs 15 ozs. (Maingay.)

Santiria laxa, King. Rau.

A tree about 30 feet tall with pendent racemes of large pink fruit.

Wood dirty white, yellowish white, grain coarse soft brittle splits in drying, weight 49 lbs 10 ozs., (Maingay). Used in building but not durable.

S. lævigata, Bl. Kerantei Merah.

A fairly large tree. Wood fairly heavy light brownish colour, rays very fine and close, rings fairly distinct, pores small, numerous, crowded and more numerous in the rings.

A good wood used for furniture and for gunstocks. Weight 67 lbs. 4 ozs.

S. fasciculata, Benn. Kerantei Batu.

A medium-sized tree.

Is used for building, but not very good.

S. apiculata, Benn. Kerantei.

Wood dirty white, grain medium fairly hard does not split in drying. Used for gunstocks.

Weight 42 lbs. $4\frac{1}{2}$ ozs. (Maingay.)

Trigonochlamys Griffithii, Hook. fil. Kadondong Mata hari, Kijai, Kumpas Ruman.

A fairly large tree 70 feet tall. Wood dark yellow or red "yellowish white, grain medium fairly hard does not split," durable.

Weight 52 lbs. 2 ozs. (Maingay.)

Used in house building.

Said to produce a scented dammar.

MELIACEÆ.

Sandoricum indicum, L. Sentol.

A large tree, attaining a height of 70 feet and diameter 2 feet.

Fast growing, cultivated for its fruit.

Wood soft and white, yellowish tinted, rings rather obscure, rays moderately thick, pores large. Gamble describes it as having a gray sapwood and red heartwood moderately hard, takes a beautiful polish, rays fine undulating marked on a radial section as long narrow bands giving the wood a beautifully mottled appearance. But it is a much poorer wood here. It is used in house building in Java (Van Eeden), here chiefly for wooden clogs, and such work as Jelutong and Sendok-sendok are used. In Burmah for carts and boat building. Weight 30 lbs. 6 ozs. (Maingay). 36 lbs. (Gamble) S. 27 lbs. 13 ozs. to 35 lbs. 9 ozs.

S. radiatum, King. Kechapi.

A very similar tree, with soft downy leaves and a more acid fruit, has a very similar wood. Van Eeden says the wood is sought for furniture and is strong.

Dysoxylum cauliflorum, Hiern. Dudali, Guatak, Parong.

A medium-sized tree with the white sweet scented flowers and red capsules on the stem, 70 to 80 feet.

Wood brownish white rather light, rays distinct, pores rather large with soft tissue round them scattered. Weight 53 lbs. 13 ozs. Rather a poor wood. Van Eeden says in Java it is a good timber in demand for house building and that it is not eaten by white ants. It is stated to be strong, durable and used in building here, giving beams that square to 8 inches. I have seldom, however, seen it of any great size.

D. macrothyrsum, Miq.

Is said also to be used in house building in Java (Van Eeden.)

D. costulatum Miq. Pasak Kerai.

Tree about 20 feet tall.

Wood rather heavy, reddish in centre lighter outside, rings fairly distinct, pores rather large not numerous, rays fine and obscure brown a rather soft poor wood much resembling that of Santiria but darker coloured, used in building.

D. acutangulum Miq. A fairly large tree not common.

Wood resembles satin wood, is hard and difficult to work according to Van Eeden.

Chisochetan pauciflorus, King. Jurai.

A medium-sized tree attaining a height of 40 to 50 feet. Wood of a dirty dark colour, sinking in water, poor.

C. divergens, Bl. Garontong Tangah.

A medium-sized tree with pendent racemes of very fœtid flowers.

Wood pale dirty reddish colour, light and soft, rings distinct, rays very obscure hardly visible, pores rather large few and scattered, concentric wavy lines very numerous and fine. Weight 40 lbs. 8 ozs.

Lansium domesticum, Jack. Duku, Langsat.

A well known fruit tree. The wood is used for rice pounders, sheaths of weapons, etc. in Java (Van Eeden). It is light coloured and not very hard, fine grained and fawn coloured, pores small, rays very fine, concentric lines wavy very close and fine.

Aglaia glabriflora, Hiern. Pasak Bras Bras, Mulupas, Pasak Merah.

A tree attaining a height of about 50 feet. Wood red very durable, floats in water.

A. odorata, Lour.

Small tree cultivated for its sweet flowers, native of China. Wood rather light reddish brown, rings narrow fairly distinct, pores exceedingly numerous very small, arranged in rows parallel to the rings, rays very obscure, concentric rings very fine and numerous. Weight 76 lbs. 9 ozs.

A. argentea, Bl. Modu.

A fair sized tree not very common. Used for house beams but not very good.

Carapa moluccensis Lam, "Nireh." "Nireh Batu."

A common tree in mangrove swamps with stiff ovate leaflets, small sweet scented white flowers and large brown fruits nearly a foot through, globose, with a rather thin rind and curious angled corky seeds.

The bark is red and flakes off, falling in piles at the foot of the tree. It is very astringent and an extract of it is valuable in cases of dysentery.

The tree is seldom tall or straight and old ones nearly always have a hollow up the middle, so that it is seldom used except as firewood or for small work. Fair sized beams can, however, be got. The wood is dark red or deep brown when old, very heavy and hard, the rays very close and fine, the pores few and not very large. Weight 63 lbs. 6 ozs.

Were it possible to get good straight beams of this of sufficiently large size it would be a very valuable wood. It resists water and lasts a long time.

As firewood it is especially used for splitting granite, two or three billets being placed on the rock, and allowed to smoulder for some time after which water thrown on the heated rock causes it to split.

The Crab-oil tree *Carapa guyanensis*, a South American tree of great repute as a timber, and producing an oil, seems to grow remarkably well here. The trees attaining a great height and growing fast and steadily, and quite straight.

Cedrela Toona, Roxb.

This Indian tree has been planted here in some quantity, and makes fairly fast growth in good soil.

The wood is red soft and open grained, durable and not eaten by white ants and used for furniture door panels, carving, and tea boxes, in India (Gamble.)

C. febrifuga.

Occurs here and there in the Peninsula where it has been planted by Klings.

Chickrassia tabularis, Juss. Chittagong wood.

A large tree with a yellowish or reddish brown wood with a satiny lustre used in India for furniture, is recorded in the materials for a flora of the Malay Peninsula as collected in Malacca by Maingay, but doubtless planted.

Swietenia Mahogani, L.

Mahogany has been planted experimentally in several parts of the Peninsula. It is very slow of growth at first at least here, and is apt to branch a good deal.

S. macrophylla.

Grows better and more rapidly. It has been planted experimentally of late years and evidently does better here than the small leaved mahogany.

OLACINEÆ.

This order contains two of our most useful first class timbers, *viz.*, Petaling and Kulim.

Ochanostachys amentacea, Mast. Petaling.

A tree of no great size usually about thirty or forty feet tall and a foot through. The bark thin and flaking off in rounded flakes, brown. The foliage reminds one of that of the English beech, the foliage being dense elliptic and shining deep green. The flowers very small green in short racemes, and the fruit an oval green milky drupe with one large seed.

The tree occurs in jungle all over the Peninsula and is quite common. If cut down it shoots up again from the old stool. Like most hard woods it is of slow growth, and it is not easy to get good seed of, as apparently many of the fruits fall unfertilized.

There is very little sapwood, the whole of the tree being usable as a hard wood timber. The wood is hard and heavy, deep brown becoming lighter coloured by exposure. The rings are fine and close and wavy, the rays exceedingly fine and numerous and very close. The pores are arranged in short lines, four or five together.

Though Petaling is by no means as large a tree as many of our best hard woods, many trees are quite large enough for almost all purposes. The timber is very durable, not difficult to work and proof against white-ants. For house work it is excellent, and attempts have been made to use it for railway sleepers, but it is said to be liable to split in the sun.

Scorodocarpus Borneensis, Becc. Kulim.

Is a tall tree with rather flaky bark, about 60 feet tall, and 1½ to 2 feet through.

The flowers which are of moderate size are white, the fruit a large drupe about an inch through, green with a thin pulp, and a large stone.

The strong odour of onions which every part of the tree gives out, including the wood when fresh makes the Kulim easily identifiable. It occurs in jungle all over the Peninsula and is highly prized as a first class timber. The wood is resinous, deep brown in colour, heavy and fairly hard. The pores are arranged in lines and are small and usually full of resin giving the wood a peculiar shining appearance, especially in longitudinal section where the vessels are seen to be full of the resin. The rays are very fine and close, the rings narrow and wavy. In appearance Kulim re-

sembles somewhat Dammar Laut, but is less dense. Weight 62 lbs. 8 ozs. It is a good wood for building bridges, houses, etc.

Ximenia americana, L. Bidara Laut.

Is a sea-shore shrub of no great size, spiny with white flowers, and orange-coloured-plums eaten by the natives. The wood is chiefly remarkable for having a pleasant scent when fresh. It is light brown in colour and rather heavy, the rays exceedingly numerous and close, the pores numerous and small. Weight 62 lbs. 9 ozs.

Ctenolophan parvifolius, Oliv. Bungkal.

Is a fairly large tree tall and straight about sixty feet in height.

Its wood is rather soft, brownish white with very fine rays and few large pores, the vessels are filled with resin, and this gives the wood a shiny appearance.

Maingay under the name "Preecha" describes it as hard yellowish white becoming red towards the centre, grain fine fairly hard, does not split in drying. Weight 54 lbs. S. 33 lbs. 4 ozs.

ILICINEÆ.

Ilex. A few species of this genus occur here of which only two are common *I. cymosa and I. macrophylla,* Wall.

Ilex cymosa Bl. Timah-timah, Titimah, Musirah putih.

A common tree of no great size in waste ground and woods with white bark, sometimes attaining a height of 50 feet with small greenish white flowers and small red drupes. Wood yellowish rather soft, with somewhat scanty pores and rather thick rays, some thicker than others.

This is a poor dirty looking wood. Weight 39 lbs. 7½ ozs. per cubic foot (Maingay) S. 40 lbs.

It is used in building, but is not durable and is considered very inferior by the Malays.

I. macrophylla, Wall. Titimah bulan, Musira bukit, Titimah Gading.

A very similar tree with larger leaves and fruits.

CELASTRINEÆ.

Kurrimia paniculata. Wall. Banak, Biko Biko.

A big tree 20 to 30 feet tall, with large dark green leaves and panicles of small green flowers.

The wood is medium hard and of fair weight, light brown in colour with numerous medium sized pores, very fine rays and fine and numerous concentric lines.

It is used in building houses but is not durable. A handsome shade tree but rather slow in growth.

K. pulcherrima. Wall. Boko Boko.

A taller straighter tree with pink flowers, attains a height of about 60 feet.

Wood dark coloured not durable.

Lophopetalum.

A number of large often vast trees with very inferior wood.

L. curtisii, King. Rujang, Kroi.

A gigantic tree the bark and wood of which are used by the Sakais in making dart poison.

Wood soft white and brittle. Weight 24 lbs.

Rhamneæ.

A small number of climbers and shrubs, or small trees of little importance.

Colubrina asiatica, Brnogn.

A large bush with green flowers, has a fine grained wood of a yellow colour shading into pink when fresh, becoming yellowish white with age, pores moderate, rays fine and parallel, might be used for small cabinet work.

Weight 45 lbs.

Ampelideæ.

Climbing vines with the genus *Leea* consisting of shrubs, and one species *Langulata,* a small tree. The wood of the Leeas known as Mamalli, Malli-malli is fairly hard, brown close-grained but light.

SAPINDACEÆ.

Erioglossum edule, Bl. "Mertajam", Kelat Layu.

A small to medium-sized tree, with red drupes eaten by children. Wood reddish white, grain fine hard, does not split in drying (Maingay). Hard dark brown, not used (Van Eeden).

Weight 54 lbs. (Maingay).

Allophyllus Cobbe, Bl. Bulakank Ular.

A shrub or small tree, wood when big enough as in the *var Rheedii* "Tumbet kayu, Kuchapai is used for rafters but is not durable.

Wood also used for walking sticks, firewood, etc.

Nephelium lappaceun, L. Rambutan.

A large tree well known for its fruit, commonly cultivated.

Wood hard and heavy, red when fresh cut becoming dirty reddish white or whitish brown, pores large scattered surrounded by patches of lighter coloured softer tissue, rays very fine and obscure, concentric rings broken up into short wavy pieces.

It is rather apt to split in drying, but is considered good for planks, beams and other hard work, for water wheels, rice mills, stampers, &c. (Van Eeden).

Weight 65 lbs. 4 ozs., 62 lbs. 3 ozs. (Maingay), S. 35 lbs.

N. glabrum, Noronha. Redan, Redan Tumu.

A medium-sized tree, fruit warty acid.

Wood brown, rings distinct, pores numerous connected by bands of light coloured tissue, rays very fine broken up. Weight 57 lbs.

A good wood for planking, etc.

N. hamulatum, Hiern. Sunggol lutong jantan.

A tree about 50 feet tall. Wood used in building, durable.

N. mutabile, Bl. Pulasan.

A well known fruit tree not as large as the Rambutan, bark rough about $\frac{1}{8}$ inch thick. Wood fairly heavy, light reddish colour, rays very fine and close, pores rather large, in bands of lighter coloured tissue, rings distinct and regular. Weight 51 lbs.

A fairly good wood harder and more compact than that of the Rambutan, but seldom used as the tree is too valuable for its fruit to cut.

Xerospermum muricatum, Bl. Rambutan Pachat.

A tree of medium size, much resembling a rambutan tree but with yellow warty acid fruit.

Wood brown light durable and good, used for buding.

N. malaiense Griff Mata Kuching.

A well known fruit tree often cultivated.

Wood light brown, moderately heavy and hard, smooth textured rays fine, pores small numerous in short rows surrounded with lighter tissue.

Much prized for tables and other furniture (Maingay.) Weight 63 lbs. $5\frac{3}{4}$ ozs.

N. eriopetalum, Miq. Sunggol lotong, Gumpo.

A fairly large tree attaining a height of 40 feet with a reddish wood.

Used in building but inferior.

N. costatum, Hiern. Rambutan Passeh.

Tree, 50 to 60 feet tall, not common.

Wood dull white mixed with reddish white, grain fine medium hard good and useful quality. Used for beams. Weight 62 lbs. 8 ozs. (Maingay.)

Guioa pubescens, Radlk. Sugi-sugi, Nilan.

A small tree about 20 feet tall with smooth bark. Wood heavy and hard, light brown, pores small not numerous, rays fairly fine, concentric lines rather distant and broad undulating. Weight 81 lbs. 15 ozs.

A common tree rather too small for much use, and the wood is said to be brittle. It is use in buildng.

Arytera littoralis, Bl. Kulu layo hitam.

A medium sized or small tree, usually growing near the sea. Wood pale reddish white, moderately heavy and hard, rings fairly distinct and remote, pores numerous small rays obscure. Weight of a specimen from a small tree, 49 lbs. 6 ozs.

Fairly hard and durable, used in house building.

Aphania paucijuga, Radl. Pukan jantan, Mumpilai Klat, Tulang putih.

A tree from 20 to 40 feet tall, not common wood rather heavy sinking in water, flexible used in house building, for posts, etc.

Lepisanthes cuneata, Hiern. Purupoh.

A tree about 60 feet tall, with white and brown wood not durable, giving beams 5 or 6 inches square.

Dodonea viscosa, L.

A sea shore shrub rather local here, is said to attain the size of a small tree in India, and to have an extremely hard heartwood close grained dark brown used for engraving, turning, tool-handles and walking sticks. It is planted for hedges in India. Most of the Malay Peninsula appears to be too wet for it.

Turpinia pomifera, Del. Geritta.

Attains a height of 70 feet, with rough bark. The wood is used for household utensils in Java, but is not strong enough for building (Van Eeden). A common tree in Singapore, Perak, etc.

Sabiaceæ.

The only trees are species of *Meliosma* of no great size and seldom or never used as timbers.

M. nitida, Bl.

A small tree about 20 or 30 feet with a straight stem has soft light brown, light wood with fairly distinct rings, pores large but few, divided by partitions and few broad rays. Weight 29 lbs. 9 ozs.

Van Eeden says it is one of the best timbers of the West Coast of Sumatra, the wood hard brownish yellow, used for planks, posts and furniture.

M. Ridleyi, King.

A small tree occurring in Singapore and Johore, wood pale brown mottled glossy, rings distinct, pores few small and medium mixed, rays distant broad.

Anacardiaceæ.

An order of trees usually large often vast, of which some possess high class hard timbers, others are soft and of little use. Many contain an acrid black resin which is very poisonous, and injurious to wood cutters and others handling the fresh wood.

Buchanania sessilifolia, Bl. Pao pipit, Pao hutan, Habong Ayam.

A medium sized to small tree. Wood pale brownish white, grain coarse soft, splits deeply in drying (Maingay.)

Weight 36 lbs. 2 ozs. (Maingay) S. 20 lbs. not durable used in house building.

B. florida, Schauer. Otak Hudang, Kata Hudang.

A medium sized tree with masses of small white flowers.

Wood dark red with very fine rays and rather large pores. Weight 28 lbs. 2 ozs.

Only used for firewood in Java according to Van Eeden.

Bouea burmanica, Griff, Rouminiya.

A large tree with small deep green leaves, well known for its eatable sour fruit, attains a height of 60 or 70 feet.

Wood rather light coloured with a darker reddish heart, sometimes dark brown, rings distinct pores few small scattered, concentric lines numerous wavy distinct.

Durable and fairly heavy sinking in water used for posts and beams, of which 6 to 10 inches square are obtainable. Weight 10 ℔s. 4 ozs..

B. macrophylla, Griff, Kadongan.

A fairly large tree, cultivated for its fruits.

Wood yellowish white becoming brown towards its centre fairly hard, does not split in drying. Used for Kris-scabbards, (Maingay) Weight 58 lbs. $4\frac{3}{4}$ ozs. (Maingay).

Anacardium occidentale, L. Cashew nut, Gajus

Cultivated and half wild, a small tree about 20 feet tall, much branched. Wood soft light brown, pores large and few, rays fine. A poor wood used for packing cases, boats and charcoal, in India. Weight (S.) 23 lbs. 10 ozs.

Odina Wodier, Roxb.

Introduced from India is a rapid growing tree raised easily from cuttings. The wood is used for various small purposes such as spear shafts, scabbard, wheel spokes, cattle yokes, etc., in India (Gamble) and for rice pounders in Java (Van Eeden).

It has much sapwood and light red heart-wood turning reddish brown on exposure, moderately hard, seasons well and does not warp (Gamble). It also produces much gum used for many purposes in India.

Weight averages 50 to 60 lbs. (Gamble).

This tree might be worth planting by road sides, etc.

Spondias mangifera, Pers. The Hog-plum and *S. dulcis*, Forst.

Sometimes planted for their fruit, have soft white useless wood.

MANGIFERA.

There are upwards of twenty kinds of Mango in the Malay Peninsula. Many of which are but little known on account of the great size of the trees the flowers and fruit of which are almost inaccessible, several, however, are well known native fruits, such as the Lanjoot, Bachang and Binjai.

M. indica L. The Mango. Mangga.

Is often cultivated here but seldom attains any great size as it is very liable to the attacks of insects especially boring caterpillars. The wood is fairly heavy yellowish white, rather soft, pores large and few, rays very fine and close, rings distinct. Weight 38 to 48 ℔s (Gamble) S. 29 ℔s.

Not used here, but used in India for planking, doors, window frames, boxes, canoes, etc. (Gamble).

M. coesia, Jack Binjai.

A very large tree, with great masses of pale pink flowers very handsome.

The wood is light red, marbled with yellow. The rings are dis-

tinct and often very broad about 15 to an inch, the pores are large and few scattered, the rays waved rather conspicuous and much broken up.

Rather an ornamental wood, the rings of darker coloured wood alternating with softer paler tissue. Weight 27lbs. to 37lbs. 8 ozs.

M. Kemanga Bl. Kemang.

A vast tree, with a perfectly straight stem and a large crown of foliage.

The wood is pinkish in colour turning brown with age and has the same few large pores and distinct rather distant rings of *M. Coesia*, but the rays are more obscure. It appears to be a better class of wood being more compact and firmer. The resin is acrid and injurious to cutters, like that of the Rengas. Weight 32 lbs. 10 ozs.

M. sp, M'bachang hutan, Medangkok.

This appears to be some species of mangifera, but from what tree it is obtained is not known. Its timber is not very hard but is valued for planking, boxes, etc. It is of a bright canary yellow when fresh becoming brown after exposure. It has rather large scanty pores two or three together, the rays are fine and the rings usually indistinct. It is rather a light wood. Weight Selangor specimen 21 lbs. 4 ozs. Johor, 20 lbs. 15 ozs. 31 lbs. 8 ozs., 42 lbs. 12 ozs., Sumatran Medangkok 61 lbs.

Melannorhea Maingayi, Hook fil. Rengas Manau, Straits Mahogany.

A very large tree with white flowers and curious red fruit with five winglike petals. The name Rengas is applied to a number of allied plants, besides the Melannorheas of which there are here, 7 species, the various species of *Gluta* and Parishias being also called Rengas. The timber known as Rengas in trade here is, however, *M. Maingayi*. It is common all over the south of the Peninsula and in Sumatra, but in the north is replaced by *M. Curtisii*, which has smaller fruit with narrower wings.

The tree has a considerable proportion of soft yellowish white sapwood, the heartwood is heavy and fairly hard dark red in colour of rather coarse texture, with distinct often broad darker coloured rings sometimes nearly black, the pores are large and scattered not numerous, the rays very fine and obscure. In young wood and sapwood the pores are encircled by lighter coloured tissue.

The wood is very handsome and valued for furniture building, etc. It has the disadvantage, however, of possessing much of the black caustic resin which is very poisonous, and gives rise to what is known as Rengas poisoning in those who cut the tree, and the same effects are said to be produced in many persons by use of furniture made from it, even long after the wood has been worked up. For beams it is durable and not attacked by termites. Indeed it is common after felling the tree to leave it lying in the jungle till the sapwood is destroyed by termites and decay when the hard and durable heartwood is uninjured by them.

Weight 30 lbs. to 69 lbs , average 47 lbs. 15 ozs.

M· Curtisii Oliv.

Is a similar tree distinguished by its smaller fruits. It attains a height of 80 feet, and the timber is exactly similar to that of the preceding and equally good. Weight from a Penang specimen 57 lbs. 3 ozs.

Gluta Renghas, L.

A big tree growing usually near the sea, much branched low down, with white flowers and rough brown corky fruits full of poisonous black resin. It occurs from Tringganu southwards, and is also met with in Sumatra, Java and Borneo. It grows well and rather rapidly from seeds. Along the banks of tidal rivers above the influence of sea water it is often exceedingly common in a bush form.

The wood is used for building, also for boats, furniture, sheath of weapons, etc., according to Van Eeden.

Gl. coarctata Hook fil. Rengas burong (Van Eeden).

Rather a scarcer tree occurs in Malacca, Banka and Sumatra.

Used for building and furniture, resisting white ants and the action of water (Van Eeden.)

Dracontomelum mangiferum Bl. Bengkuang, Sengkuang.

A big tree, not very common here.

Wood used in house building but not good.

Melanochyla auriculata.

A stout but not lofty tree, with large dark green leaves and green flowers, wood brownish grey, prettily mottled not hard pores rather large and often divided rays fine and brown. Weight 45 lbs. 8 ozs.

A pretty wood but somewhat soft.

Swintonia, Gigantic trees, attaining a height of about 100 feet.

S. spicifera, Hook, fil. Mupus.

A big tree occurring in Penang and Perak.

The wood is heavy, light brown in colour with distinct rather close rings marked by deposits of black resin about $\frac{1}{8}$ inch apart, pores medium-size numerous scattered, rays very fine and close. A good useful wood.

S. Schwenkii, Teysm. Balau Betina.

Not common, occurs in Malacca.

According to Maingay this has dull whitish wood with light brown striæ, grain medium fairly hard. It does not split in drying. Its weight is 47 lbs. $15\frac{1}{4}$ ozs. per cubic foot.

Campnosperma, Wallichii King. Teruntang.

A big tree with wide spreading branches and very large leaves, flowers in small panicles green common especially ins wampy spots.

The wood is soft, and rather light silvery grey or white and fine

grained. The pores are rather large and numerous, the rays fine and brown, obscure. Weight S. 18 lbs. to 22 lbs. 8 ozs. A good useful wood for light work, and its beautiful smooth silvery appearance makes it suitable for cabinet work.

Microstemon Velutina, Engler. "Shinge."

A big tree 70 to 80 feet tall wood whitish brown produces a damar.

Semecarpus affvelutina, Sulumah, Kumbal Bunang.

About 40 feet tall, used in building.

CONNARACEÆ.

All are climbers except some small trees known as *Ellipanthus*, *E. Griffithii*, Hook fil. is a slender tree about 30 feet tall, with light fawn coloured wood fine grained, with rather small scanty pores, rays fine and broad mixed and fine concentric lines. A soft wood only good for poles and rafters. Weight 42 lbs. 9 ozs.

PARA RUBBER IN THE STATE OF AMAZONAS.

The following recent interesting and valuable Report by Mr. Consul TEMPLE, on Para Rubber at "home" will no doubt be read by planters here with great interest:—

In Brazil several kinds of laticiferous trees exist from which rubber is manufactured. In the State of Ceara the *Manihot Glaziovii*, locally known as the manicoba, is fairly extensively worked, and considerable attention is being paid to its cultivation. In the State of Maranhao the *Hancornia speciosa*, or mangabeira, is beginning to give results. These trees, however, are unimportant compared to the *Hevea Braziliensis*, or seringueira, to which the Amazon Valley owes its present prosperity.

The *Hevea Braziliensis* is found scattered through the forests that clothe the banks of the Amazon River and its tributaries. In some parts it is much commoner than in others, and for no apparent reason. Very large tracts of forest are to be found where it does not exist or is very scarce. It is generally met with in the swampy parts of the forest. Owing to the lack of trusworthy data on the subject it is not possible to state with certainty the proportion of *Hevea* compared to other trees existing in the forest. However, for districts where it is fairly plentiful, and for areas of 1,000 acres or more, about one tree to every 2 acres may, I think, be taken as a fair estimate.

The *Hevea Braziliensis* does not strike the eye amongst the other innumerable varieties of trees to be met with in the Amazonian forests, and is often difficult to detect. A peculiar glistening of the trifoliate leaves and the whiteness of the bark serve as a guide to the practised eye. The tree grows to the height of 70 to 100 feet, and has, as a rule, when full grown, a girth of from 5 to 7 feet at a height of one yard from the ground. The trunk is

generally free from branches to a height of some 30 or 40 feet from the ground. The tree flowers in January; the seeds are ripe and begin to fall in March in the case of old trees, and in May in the case of young trees. The seeds are contained in a hard shell, two, three or four in each shell, which hang by a short stalk from the upper and outer branches. When ripe the shell explodes often with quite a loud report, scattering the seeds to considerable distances. For this reason it is difficult to procure seeds. When collected the seeds should be packed in powdered charcoal and sent to their destination without delay. I am informed by a competent authority that they are not, as a rule, fertile if kept for more than two months after being collected. This fact would account for the difficulty experienced in rearing this plant in Africa, Ceylon and other parts.

Setting aside scientific phraseology and distinctions there are, for practical purposes, three distinct varieties of the "seringueira" to be met with in the forest. These are locally known as the seringueiras "casca vermelha" (red bark), "barriguda" (bellied), and "casca preta" (black bark). The first of these, the "casca vermelha", grows in the higher parts of the forest which are seldom or never flooded. The latex which it yields is scanty, thick, and will not run. It is, therefore, of little value.

The second of these, the "barriguda" so named, because the trunk increases very rapidly in thickness towards the base, grows in those parts which are almost constantly flooded, named "igapos". It yields plentifully a thin watery latex which is of little value.

The third variety, the "casca preta", grows in those parts where a certain amount of drainage exists, and which form an intermediary zone between the permanently flooded parts and the high land. It is this variety which yields latex from which the rubber of commerce is manufactured.

The "latex", or as it is commonly known, the "milk" of the tree, is a milky juice contained in special tubes running amongst the other tissues of the plant. These tubes in the case of the *Hevea,* are connected, forming what is known as the "laticiferous system". The latex is quite different from what is called the "sap", and probably does not play any part in the nutrition of the tree. According to some authorities, it forms a reserve of water to be drawn upon in cases of drought. The actual extraction of latex cannot kill the tree, and the common statement that the trees are "bled" to death is a mistake. As a matter of fact, though trees exhausted, in as much as they will not yield any more latex, are common, actually dead trees killed by overtapping are rarely met with. The latex, as it exudes from the bark is of a dazzling whiteness, resembling milk, which it also resembles in composition, inasmuch as it consists of an emulsion in which "caoutchouc" takes the place of the "butter" in ordinary milk. The fluid part of the latex consists of water with very small quantities of albuminous matter, organic acids, and phosphates in solution.

The extraction of the latex, or, as it usually called, the "tapping" of the tree, is effected by making an incision in the bark of the

tree. From this incision the latex flows for about three or four hours, after that it stops flowing of its own accord. The incision should not penetrate beyond the bark, which is generally about $\frac{3}{8}$ inch thick, into the wood of the tree, and for this reason a very small axe, which rapidly thickens, wedge-like from the cutting edge is used, the shape of the instrument preventing its entering too deep. The axe is generally about $\frac{3}{4}$ inch wide. The custom is to strike with it a back-handed blow upwards, thus making an oblique cut on the bark. It is probable that a better method would be to use a chisel and mallet and make a V-shaped incision. Recent experiments at Henaratgoda have shown the advantage of this shaped incision.

The incision having been made, a small tin cup of a capacity of about 4 ozs. is affixed just below it to receive the latex as it flows. This is effected by pressing the edge of the cup, which is sharp, into the bark until it gets a sufficient hold to remain firm. By this method, however, a second wound is made in the bark which is injurious. No better method has as yet been suggested. In some places a winding groove is cut in the bark of the tree, and by means of a clay breastwork the milk is conducted into a vessel placed at the foot to receive it. This method is found, however, to be very exhausting to the tree and is falling into disuse. The usual mode of tapping is to make an incision with the axe at the height of some 6 or 7 feet from the ground; on a level with that incision and at a distance of some 8 inches a second cut is made, and so on round the tree. On the next day incisions are made just below these, and so on day by day until they reach the ground. Incisions are then made on the same plan beginning as before from the top, and working downwards between the former rows. A tree that will carry seven cups 8 inches apart is considered a large one, and though trees that will carry eight or nine cups are to be met with, the average do not carry more than four or five.

It is not possible in the present state of the industry to give any precise data as to the average yield of latex per tree. To begin with, the trees are extremely irregular in the yield. Two trees growing close together and under apparently precisely similar conditions, will often vary very much as regards their yield of latex. Some trees are very rapidly exhausted, whilst others have to be tapped for some time before they yield the full amount of latex of which they are capable. The natives account for this by saying that the tree has to be accustomed to being tapped. Sufficient data are not available to enable any judgment to be formed as to the correctness of this view. It is certain, however, that even the most experienced cannot judge of the value of a rubber estate before at least a year's work has proven it. The examination of the books of a number of rubber estates actually working and from reliable information received, leads me to believe that, for estates working with over 20 men, a yield of 300 kilos. per annum per man may be expected should it be a good district; 200 kilos. should the district be only fairly good; and 100 kilos. per annum

per man should the estate be already overworked. As each man works 200 trees, this would place the yield of one tree, when worked under satisfactory conditions at 1 to 1½ kilos. per annum. On the same basis and taking the whole of the crop from the Amazon district as being 24,000 tons (about) per annum there would appear to be about 120,000 labourers employed in cutting rubber at present. Calculating still on the same basis there should be some 24,000,000 trees being tapped, and these on a basis of one tree to every 2 acres would give an area of about 50,000,000 acres of forest at present being worked for rubber. When it is considered that the district in question embraces well over 1,000,000 square miles, and that it is by no means easy to find virgin rubber forest within 200 or 300 miles of Para or Manaos, it will be seen how comparatively scarce is the *Hevea,* in the Amazonian forests.

The *Hevea,* is found to yield its latex more freely at the base than higher up the trunk. In some places, however, where the trees have already been considerably worked, and the lower part of the trunk is already covered with knobs due to excessive tapping, it is the custom to build stagings in order to enable the rubber cutters to reach a higher portion of the trunk. A good tree will still yield freely to a height of some 20 or 30 feet.

If allowed to rest for three or four years, even a completely exhausted tree will quite recover itself, and may be worked again from the base. As has been already stated, the tree is not killed when the supply of latex runs short, and as a rule sufficient damage has not been inflicted to prevent the tree from recovering itself. This fact is important, as owing to it the supply of rubber available will probably not run short as has been often prophesied of late. Trees have been known to have been tapped off and on during 50 years, and to be still yielding a plentiful supply of latex.

The latex having been obtained and collected the "caoutchouc," or rubber known to commerce, may be obtained from it in various ways. The only method, however, that has met with practical success is that of evaporation, by which the watery portion of the latex is driven off and solid caoutchouc remains. The object to be secured is that as little water and proteid matter shall remain in the caoutchouc, the putrefaction of the caoutchouc, owing to the presence of these matters being extremely detrimental to its elastic properties, and, therefore, to its market value. In the Amazon district the method followed is to light a fire upon the ground and to invert over it a specially constructed funnel-shaped-chimney. From the narrow end of the funnel, which is open, the smoke and heated gases pour out in a concentrated form. The fuel used for the fire consists, as a rule, of chips from any hardwood tree that grows handy to the labourer's hut. The nuts of the "Urucury palm" (*Attalea excelsa*) are sometimes used, their smoke containing a trace of acetic acid and creosote being found particularly effective in curing the rubber and preventing putrefaction. It is, however, a mistake to suppose that all or even a large proportion of the rubber coming from the Amazon district is cured in this way. It is, on the contrary, very rarely that the rubber-cutter will be at

the trouble to collect these nuts, he nearly always prefers to use wood chips which give him less trouble to procure.

The fire having been made, and a large stream of hot smoke pouring out of the chimney, the operator seats himself on a small stool by the side of it. The latex is contained in a basin placed at hand. In his right hand he holds a paddle-shaped piece of wood; in his left hand a small calabash. Dipping the calabash into the basin of latex he pours a small quantity over the paddle, which he then revolves in the smoke issuing from the chimney. That having dried in a layer over the paddle he repeats the operation. In course of time a "ball" or "biscuit" of solid rubber is thus formed. In some parts, where it is the custom to manufacture very large balls or "pellets" an arrangement is made by means of a pivot to rotate the ball over the chimney. The wooden core is withdrawn through a slit made in the "biscuit", or simply drawn out in the case of the "pellet."

The latex of a tree named "Macaranduba" (Mimusops-elata) and more often that of a tree named locally "Amapa" is sometimes used to adulterate that of the *Hevea*. In both cases the adulteration is extremely prejudicial to the quality of rubber produced.

Three distinct qualities of rubber are manufactured in this district named "Fine," "Entrefine", and "Sernamby" respectively. "Fine" rubber has been well smoked, and is free from putrefaction. "Entrefine" rubber has been either burnt whilst being smoked, or has been insufficiently smoked, and has therefore putrefied. It is due to carelessness on the part of the workman, which it should be possible to avoid. "Sernamby" is the "negrohead" of commerce, and consists of scraps, mixed with dirt, or strips peeled off the bark of the tree and mixed with impurities of sorts.

A very important factor, from the merchant's point of view, in the rubber trade, is the loss of weight that is constantly taking place in raw rubber. This loss is extremely variable, and a consignee has to place the greatest faith in the consignor that the invoiced weight of rubber has really been shipped as more or less shortage invariably takes place. Moreover, the shrinkage in weight is so variable that no exact figures can be quoted by which it may be calculated. The cause being the evaporation of the water contained, it varies according to the quality, being greater in the case of the porous "Sernamby" than in the firmer "Fine" rubber. The longer rubber is kept and the larger the pieces the less it loses in weight. Dry "Sertao" rubber coming from distant parts whence shipments are only made once a year will lose only about 1 per cent. between the estates and Manaos; whereas newly-made rubber coming from close at hand will lose as much as 10 per cent. As the means of communication get more rapid, and the rubber reaches Manaos sooner after being manufactured the tendency to lose in weight becomes larger. Between Manaos and foreign markets a loss of 4 per cent. may be taken as an approximation of the average loss of weight.

A machine designed on the principle of a cream separator to

separate the caoutchouc from the watery part has been tried, but has not proved successful as regards the latex of the *Hevea*, though good results have been stated to have been attained with the latex of the "castilloa."

Another means of separating the caoutchouc is to add chemical reagents which cause the latex to coagulate. Of these acetic acid and corrosive sublimate have been found to give the best results. The latter owing to its antiseptic properties would appear particularly suitable. A solution of alum is used to a small extent in the State of Matto Grosso, to prepare rubber from the latex of the *Hevea*.

The following analysis of the latex of the *Hevea Braziliensis* is given by SEELIGMAN :—

	Analysis.
	Per cent.
Caoutchouc	32
Nitrogenous matter	2·3
Salts	9·7
Resinous matter	traces
Water	55 to 56

THE TRANSPORT OF TROPICAL FRUIT.

From time to time the possibility of exporting tropical fruit to temperate climates is spoken of and written about, and it is urged that science has not yet been called on to assist in the consummation of this desirable end. At the present moment there are two systems of transport suggested :—The first and best known being cold storage, and the second a more vague and undefined one, but which may be described as the antiseptic, that is being treated in such a way as to exclude all air from the fruit during transit. Now as regards the first system we see it in operation to a certain degree on all the more important lines of ships, not only for preserving fruit during transit in hot climates, but other comestibles as well, such as milk, butter, meat, etc., it may therefore be regarded as an already well recognized system, but wanting in some details, which further careful experiment alone can solve.

Turning for a moment to the alternative system, I may here record an experiment I made when in Penang some three years ago. It had often occurred to me to try and send home ripe fruits of the mangosteen, by coating the fruits with a substance which would exclude air, for this purpose I gathered very carefully four dozen fruits, and had a light shallow box made with 4 dozen compartments similar to a box for the transport of eggs. The first dozen fruits were quite ripe, and to exclude air I dipped them in melted bees wax which instantly coated them with a glistening layer of wax, they were then carefully wrapped in tissue paper and put in the box. The second dozen fruits were selected, were not

quite ripe, they were wrapped in paper and put in the box. The third dozen were also not quite ripe but were dipped in the hot wax before being put into their compartments, and finally the fourth dozen were ripe fruits but not coated, the fruits were made secure from bruising by being surrounded with dry saw dust. They were sent by Parcel Post and consigned to Mr. CURTIS at home who opened them immediately on arrival, and reported on their condition. I regret to add that the Report was "an absolute failure not one fruit arrived in an eatable condition, nor was there much difference between those coated with wax and those not coated, or between the fully ripe and those not quite ripe."

I am by no mean discouraged by this apparantly complete failure, and hope on a favourable opportunity to make further experiments in this direction, for I know by actual experience that Mangosteens can be taken in perfectly good condition as far as Aden without any special preparation, and it would seem that on this latter occasion if care had been exercised to prevent the fruits from getting bruised they might have been carried much further in good condition.

As regards the cold storage system we know that certain fruits will travel well for long distances, there is however unfortunately in many cases a loss of flavour; this was noticeable in some Pomeloes recently taken home in the refrigerating room of a mail steamer, the fruits were perfectly sound but the flavour was more or less lost, and the same remarks apply to Apples that one sometimes gets in the Straits, sent here from Australia and California, and not only from these places but also from England, where well known varieties have arrived in good condition, but flavourless or nearly so.

It would be interesting to experiment with different temperatures possibly a much higher one than the refrigerating room would be sufficient to preserve the fruits and possibly without destroying the flavour.

THE WORLD'S TEA AND COFFEE CONSUMPTION.

Nearly half a billion pounds of tea were consumed in the year 1900 in countries other than the sources of production. The United Kingdom is the world's greatest importer, having taken for consumption during the year 1900, in round numbers, 250 million pounds of tea, as against 116½ millions imported for consumption by Russia, 83·3 millions by the United States, 7½ millions by the Netherlands, about 6½ millions by Germany, and nearly 2½ millions by France. A comparison of the tea consumption of the past year, with what of earlier periods, discloses the fact that tea is becoming more popular as a beverage in European countries, though little more than holding its own in the United States where coffee is the favourite beverage. The five European countries United States,

Russia, Netherlands, Germany, and France, took for consumption in 1890, 274 million pounds of tea; and in 1900, 383 million pounds, an increase of 40 per cent. The United States, on the other hand, has not materially increased her consumption of tea during that period, 83 million pounds, according to a recent United States report, being the consumption for both the initial and final dates of the period under consideration. The relative popularity of tea and coffee in the United States and the United Kingdom may be seen from the *per capita* consumption of those articles in the two countries. For the year 1900 the relative *per capita* consumption in the United States was 9·8 pounds of coffee and 1·1 pounds of tea; in the United Kingdom, 6 pounds of tea and ·71 of a pound of coffee. The net imports of tea into the United States have remained almost stationary since 1890, having been 83,494,956 pounds in that year, and 83,303,177 pounds in 1900, and for the fiscal year 1901, are expected to be approximately 90,000,000. Into the United Kingdom, the imports of tea for consumption have increased from 194,000,000 pounds in 1890 to 250,000,000 pounds in 1900. The net imports of coffee into the United States have increased from 490,000,000 pounds in 1890, to 749,000,000 pounds in 1900, while into the United Kingdom 28,000,000 pounds were imported for consumption in 1890, and 29,000,000 in 1900, the growth being almost imperceptible. The following Tables show the exports of tea from the four principal countries of production in 1898, 1899 and 1900:—

Countries.	*1898.* Million pounds.	*1899.* Million pounds.	*1900.* Million pounds.
China	205	217	184
India	157	175	189
Ceylon	119	138	149
Japan	41	46	43

The following Table shows the relative consumption of tea and coffee during the year 1900, in each of the countries named:—

Countries.	Tea Million pounds.	Coffee Million pounds.
United Kingdom ...	250	29
Russia	117	18
United States ...	83	749
Netherlands ...	8	86
Germany	7	352
France	2	180

The relative consumption of tea in the United Kingdom and the United States is shown in the following Table, which compares the imports for consumption in the United Kingdom, with those in the United States, in each of the years from 1890 to 1900 inclusive:—

Imports of Tea for consumption into: —

Year.		United Kingdom Million pounds.		United States Million pounds.
1890	...	194	...	83
1891	...	202	...	82
1892	...	207	...	90
1893	...	208	..	88
1894	...	214	...	92
1895	...	222	...	96
1896	...	228	...	93
1897	...	231	...	113
1898	...	235	...	68
1899	...	242	...	73
1900	...	250	...	83

An interesting feature of the development of the tea trade, so far as the United States is concerned, is the increasing proportion which India and Ceylon supply of the imports into that country. The exports of tea from India to the United States increased from 228,000 pounds in 1895 to 1,414,000 pounds in 1899, and those from Ceylon increased from 183,000 pounds in 1895 to 2,060,000 pounds in 1899. *Journal of the Society of Arts—August, 1901.*

NOTES ON THE VALUE OF THE INCIDENTAL INCREMENT OF PLANT FOOD IN SOILS.

The value of the incidental increment of plant food in soils covered with certain crops, is hard to estimate. One difficulty has been, that the cultivator who depends solely on analysis of the soil, as a guide to its fertility, has often found a certain amount of available food in his land unaccounted for, *i.e.*, the plant has obtained food in some way which the analysis of the soil did not show. It is a favourite maxim of the Agricultural Chemist since Liebig expounded his mineral theory of manures, that there is so much available plant food in the soil, and if a plant takes up and uses a certain amount of this, that there must be so much left. This has since been modified by Ville and others. While allowing that the basis is one which necessarily must always be a guide to the cultivator, it is known to the experienced that the theory is unsound, and that plants uncultivated or cultivated, as a rule, get more food than could possibly be afforded by the soil alone, the fertility of which may have been determined by careful analysis. In temperate climates the incidental increment of plant food is not so large as in the tropics, where it is an element in cultivation which has to be taken into account by every planter. Soils, which on analysis show themselves to be poor and barren and which would indeed be poor and barren soils in a temperate climate where there is less incidental increment, prove in the tropics to be soils on which excellent crops can be grown, in fact, the soil appears merely to act as a medium for the absorption of food by

the roots, and not as a regular storehouse of nutriment from which the plant can at once take up the full of its requirements. I well remember an eminent Chemist remarking to me on the excessively barren character of the soils of the interior in certain parts of the mainland, as shown by analysis, and yet these same lands had grown large tracts of forest and the trees were giants. There can be no doubt whatever that such growth is due, not to the natural or contained fertility of the soil, but to the incidental increment which is continuously being added in the course of seasons by natural accumulations. That leaves and flowers have long been known as fertilizers of no mean kind by practical men goes without saying, but the exact manner in which nutriment is taken up and the exact quantity of plant food which is annually derived from this source is yet to be fully determined. In a recent paper on the flowers of the "Bois Immortel" or Erythrina sp. (reprinted in this Number) the large proportion of nitrogen which they contain was pointed out and an argument was based upon it for the continued use of this tree for shading cacao plantation. It has been known, however, that the flowers of all kinds of trees contain large amounts of nitrogen, and that it is quite as probable that the flowers of any trees that might be substituted as shade for cacao would contain as much nitrogen as the "Immortel".

There can be no doubt whatever that this incidental increment is valuable, as are many others as yet undiscovered or unrecognised, especially so the amounts of nitrogen distributed by the crops of seed from leguminous trees, which fall and rot, for the most part upon the ground. The incidental increment deposited in the form of the excreta of birds, reptiles and insects, and by the death and decay of their bodies is as yet an uncalculated item, and yet it will be found on examination that it is sufficient to account for the supply of certain plant food which would be otherwise absent. The lime and phosphate in the bones of an animal or reptile is comparatively small, but still their bodies give to the soil constituents, which it requires for nourishing certain kinds of plants. It is often argued that as so many thousand bushels or bags of cacao are sent out of Trinidad that the soil must in time become exhausted, and the argument follows this line when a supply of nitrogen from the flowers of the "Immortel" is spoken of. We find, however, cacao plantations in full bearing which have been under cultivation 50 or 60 years and producing to-day as much as in the first instance, and without artificial manure. We might be told that the supply of plant food naturally existed in the ground and was made available as required. If we accept this, then it is clear we ought to be able to ascertain exactly by analysis how much food the soil contains and how long the supply will last. But this has as yet never been done, for there has always been the "incidental increment" which daily and hourly accumulates to upset this addition and subtraction theory, which is so neatly propounded in many cases in the teaching of non-practical men. We are told that so many tons of plant food is removed, but we seldom get the amount per tree, as the amount would appear too insigni-

ficant. In some cases merely a pinch. It is insignificant in a sense and is readily replaced by incidental increments hitherto much, but not wholly disregarded. In Johnson's Agriculture Chemistry, p. 3, the author says:—

"It is extremely difficult nay impossible, to estimate exactly "what quantity of plant food is present in a soil in a condi-"tion available for the plant's immediate needs. This is "really best ascertained by experimenting with the plant "itself." Professor Johnson also states it to be one of the objects of the farmer to test the opinions of theoretical men, "for it is only on a basis of often repeated, skilfully con-"ducted, and faithfully recorded experiments, made by in-"structed persons, that true theories can ever be successfully "built up, hence (we say) the importance of experiments in "practical Agriculture".

What the incidental or natural increment of plant food on an acre of land in Trinidad is we do not know, but it is quite evident that it exists, and has to be counted on by the Agriculturist in cropping his land. A large amount of incidental plant food is evidently conveyed by rain water. How much we don't know as no regular analysis of our rain waters is available. It appears probable also that the fertility given by the deposited excreta of small animals, birds, insects, and worms and reptiles and the decay of their bodies, upon the ground, and also the decay of vegetable matter, dust deposited by wind, leaves, flowers, seeds and branches, &c., is largely in excess of what has been previously estimated, and in fact is, of as much importance as food obtained from the reserves held by the soil itself. This must be known as the "incidental increment" and must be taken into full account in all Agritural operations.—*Agricultural Bulletin, Trinidad, April 1901.*

PHOSPHATES AND PHOSPHORIC ACID.

As superphosphates and other phosphatic manures are coming pretty largely into use, it is desirable that the exact meaning of the above terms should be well understood. For though all phosphates contain phosphoric acid, yet in quotations from an analysis given by a manufacturer or seller it is all important to have a definite statement of which of the two substances is meant. For the value of the manure depends on the available phosphoric acid it contains.

On this subject Mr. Pearson, Government Agricultural Chemist of Victoria, thus advises the farmers:—

"It has been reported to me that farmers in some of the country districts who are intending to order manure for the coming season are likely to be somewhat misled as to the relative meaning of phosphoric acid and phosphates. Some years ago it was the custom to value phosphatic manures according to the amount of phosphate of lime contained in them. But as there are no less than four different kinds of phosphate of lime, each of which contains different proportions of phosphoric acid and lime, confusion and misunderstanding arose from this method of representing the value

of manures, a confusion which almost universally resulted to the disadvantage of the purchaser. Consequently, leading agricultural chemists in recent years have discarded the use of the term phosphate in manure analyses, and have confined themselves simply to the essential plant food in the manures, namely, the phosphoric acid, distinguishing between the three kinds, water soluble, citrate soluble, and insoluble. The "water soluble" is that form which is most readily available, and every one per cent. of it in a ton of manure is worth, at average Melbourne prices, about 6*s.*; so that 2 per cent. would be worth 12*s.*; 10 per cent. 60*s.*; 15 per cent. 90*s.*, and so on. The "citrate soluble" is not soluble in water, but is soluble in weak solutions such as are contained in the soil, or are exuded from the roots of plants. It is somewhat less valuable than the water soluble, and every one per cent. in a ton of manure may be taken as worth 4*s.* 6*d.* That which is called "insoluble" is not absolutely insoluble; it is, however, only very slowly soluble in the soil. It requires strong acids to bring it quickly into solution. Every 1 per cent. of this form in a ton of manure may be taken as worth about 3*s.*

It is advisable when buying superphosphates and other manures of the same class to pay attention simply to the percentage of phosphoric acid, and to neglect altogether any statements as to the amount of "phosphates." It is greatly to be desired that manure merchants and vendors should altogether discard the use of the term phosphates, a term which really misleads farmers, and tends to perpetuate ignorance as to the real nature of manures.

The confusion arising from the use of the term "phosphates" is well illustrated by what has been reported to me recently in regard to concentrated and ordinary superphosphate. Concentrated superphosphate contains 45 or 46 per cent. of phosphoric acid nearly all water soluble. It is offered now at £13 10*s.* per ton. Last year it was offered at £12 10*s.* The ordinary superphosphates vary somewhat, but generally they contain about 17 to 19·9 per cent. total phosphoric acid, of which two-thirds is water soluble. They are generally sold at £5 per ton.

Now 17 per cent. of phosphoric acid, if combined with lime, would form 37 per cent. ordinary phosphate of lime, 37 is a larger and more imposing figure than 17; and it is easy to confuse farmers by talking about 37 per cent. phosphates. I am told that ordinary superphosphates are being commonly advertised as containing 36 to 48 per cent. soluble phosphate: and to farmers who have intended buying concentrated superphosphate it is being said "Why should you pay £14 10*s.* per ton. for a manure containing 45 per cent. phosphoric acid, when you can buy what we offer, containing nearly the same amount, nearly 36 to 38 per cent. soluble phosphate, for only £5 per ton?"

To compare manures one with another, it is necessary to always use the same terms; either they must all be valued in terms of phosphoric acid, or else they must all be valued in terms of phosphate of lime. It will never do to sometimes use one system and sometimes the other?

If phosphoric acid be agreed upon as the term for common use, then concentrated superphosphate will be represented as containing 45 or 46 per cent. of phosphoric acid, mostly water soluble, and ordinary superphosphate will be represented as containing 16½ to 17½ per cent. or more, phosphoric acid, mostly water soluble. If phosphate of lime be agreed upon as the term for common use, the concentrated superphosphate must be stated as containing from 98 to 100 per cent. phosphate, mostly water soluble, and the ordinary as containing 36 to 38 per cent. phosphate, mostly water soluble.

I feel sure that I can successfully appeal to all respectable manure manufacturers and merchants, who recognise that the spread of precise knowledge as to the real nature of manures is in the interests of all concerned, to adopt that system which has heen agreed to by a consensus of opinion amongst the leading chemist of the day. All buyers of superphosphate should insist upon being informed as to how much water soluble phosphoric acid the manure is guaranteed to contain."

NOTE.

We note the Kajang Coffee and Rubber Company (Limited) has been registered in London with a capital of £23,000 in £1 shares. The object is to acquire (1) the West County Estate in Selangor, on which the business of growing and dealing in coffee, tea, rubber, and fruit, and prospecting for minerals is now carried on by A. A. Allen, F. R. Hicks, Frances M. Morten, Florence C. H. Morten, and E. B. Skinner, as Allen & Co.; (2) the Belmont Estate, also in Selangor, in which a similar business is carried on by the Hon. E. Field, M. S. Parry, and C. W. Prosser, and (3) the Weld's Hill Estate in Selangor, on parts of which a similar business is carried on, and other parts of which are being developed for building purposes by the persons and to carry on the abovementioned businesses. There will be no public initial issue. The first directors are C. W. Prosser, A. A. Allen, E. Fielding, and F. R. Hicks.

GUTTA PERCHA IN CEYLON.

It is reported that Mr. Herbert Wright of the Ceylon Botanic Gardens Staff is in charge of an expedition to the Hilly districts of the S. W. of Ceylon for the purpose of investigating the trees there which produce gutta percha. Dr. Trimen describes seven species of Palaquim in the Flora of Ceylon but adds "Our species are apparently ill defined, but I have had little opportunity of examining them in a living state. All are endemic, and inhabit the wet forests of the low moist region. They yield a milky juice (Gutta Percha) but none is collected from Ceylon species"—Mr. Wright, however, in writing to a friendi n Colombo. Says " Hinidoonkanda is just the place I anticipated. The soil is very poor, there is plenty of water and an altitude of 2,200 feet. Under such conditions you will not be surprised to learn that I found over 70 trees of the particular species required, and some of which attain considerable dimensions There is plenty of gutta percha in these trees and I could go on

collecting for three months quite comfortably. Should the samples prove of high commercial value, it will be an easy matter to collect many thousand of seeds and seedlings of this species from Hinidoon alone." This is so far very satisfactory; and should the gutta turn out to be equal in value to that produced by the Malayan species, it will be an interesting fact to record that a product so valuable should have remained unknown or at least unworked for so long in an Island like Ceylon. The Report of the Chemists will be of very great interest.

A NEW CURE FOR DYSENTERY.

Numerous applications from various parts of the world have been received for seeds of a plant known as Brucea sumatrana the seeds of which are said to be a specific for the cure of dysentery. It is a shrub with large leaves, with numerous leaflets; and is distributed over Borneo, Sumatra, Java, Philippines, S. China and Australia—We have specimens recorded from Perak and Pahang only. The plant is being propagated from seeds and it is hoped that in a few months seedlings will be ready for distribution.

THE NEW CHIEF FOREST OFFICER.

Mr. A. M. Burn-Murdock of the Indian Forest Department, who has been appointed by the Secretary of State for the Colonies as Chief Forest Officer for the Colony and the Federated Malay States reported his arrival on the 1st. inst. He began his tour of the variousReserves by inspecting the gutta percha plantations in the Bukit Timah Reserve, Singapore, and expressed his pleasure at what he saw.

Mr. Murdock has just come from Burmah in the lower part of which the Forests are what are known as (Evergreen tropical) like our Malayan Woods—and approach them somewhat in the nature of their contents.

CORRESPONDENCE.

The following correspondence has been courteously supplied by the Secretary to the Chamber of Commerce, Singapore.—

H. M. CONSULATE—PARA.
September 11th, 1901.

Sir,—I have to acknowledge the receipt of your letter of the 25th of July last requesting information on the subject of Para Rubber.

Twenty-seven thousand seven hundred tons of Rubber were exported from the Amazon Valley during the year ended June 30th, 1901, of which 8,700 tons came from the State of Para. During the year ended 31st December, 1900, this port shipped * 15,000 tons, the rest was shipped from Manaos and Iquitos.

Islands Rubber comes from distances varying from 50 to 300 miles. Other Rubber comes from places 500 miles away.

The upriver article comes from the head waters of the rivers Madeira, Purees, Jurua, and Javary as far as 3,600 miles from here.

The cost of Islands Rubber is from 1*s.* 2*d.* to 2*s.* per lb. The cost increases with the distance.

No system of cultivation exists, nor is any being attempted.

For more information I would refer you to the following Consular Reports: —

State of Para No. 2,140 of 1898.
State of Amazonas No. 530 of 1900.

I regret I cannot supply them to you, as I have no duplicate.

I have &c.,
(Sgd.) H. B. S. CHURCHILL,
Consul.

The Secretary, Chamber of Commerce,
Singapore.

H. B. M. CONSULATE,
Mexico City, D. P.
September 7th, 1901.

Sir,—I have been requested by His Majesty's Consul to acknowledge the receipt of your letter of the 25th of July, and to inform you that there is practically no rubber at present exported from Mexico, forty tons of wild rubber having been shipped from the State of Chiapas, and ten tons from Coatzacoalcas, a port in the State of Vera Cruz.

2. The cost cannot be estimated, as the wild rubber is collected by the Indians and sold by them to Traders at the mouths of the Rivers.

3. A very large acreage is being put into rubber there being several plantations, which have from two to four hundred thousand trees, none of these plantations have been in existence for seven years which is the time needed in Mexico for rubber to give results, so their ultimate future is problematical.

I may add that the acreage is being greatly increased, the majority of Companies and individuals who are planting rubber are Americans.

The average number of trees planted to the acre is 180, American investors seem to have every confidence that rubber in Mexico will give large profits, but up to the present moment no results have been given, which would justify these beliefs.

H. HASTINGS HORNE,
Pro Consul.

Chamber of Commerce, Singapore.

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* Part was produced outside tihs State.

LANADRON ESTATE, MUAR,
Via Singapore,
Straits Settlements,
11th December, 1901.

Dear Sir,

In reading Mr. BAILEY'S article "on the attack of white ants on Para Rubber Trees" contained in the first number of the Bulletin, I thought it might interest you to know what my experience has been. The age of my trees is from two and three quarter years downwards and as yet I have not had a single established plant destroyed by white ants although certain portions of the Estate contain numerous ant heaps such as Mr. BAILEY describes; on one ten acre block as many as two hundred. This, Sir, may slightly bear out your theory that a fungus is principally instrumental in destroying the trees in Selangor.

I have tried to make use of my ant heaps by planting Gutta Rambong on them. About eighteen months ago I had a few planted up with this variety of rubber with such encouraging results that I have now planted Ficus on all my ant mounds. Whether after some years they will suffer, remains to be proved, but up to the present they certainly show more vigorous growth than those planted on the flat, and their aerial roots are much quicker developed.

I am encouraged to give you my observations on this matter in consequence of the remark in your article a "Diseased root of Para Rubber Trees" in the second issue of the Bulletin in which you invite planters' observations and opinions, without which, in fact, the primary object of the Bulletin will be lost sight of.

I remain, Sir,
Yours faithfully,
FRANCIS PEARS.

The Editor,
Straits Agricultural Bulletin,
Singapore.

MARKET AND TRADE REPORTS.

Singapore--October, 1901.

	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang - -	47	30.00	27.00
Bali - - -	133	26.50	23.00
Liberian - -	268	20.75	17.00
Copra - - -	2,920	9.35	8.25
Gambier - - -	1,802	13.30	11.42½
Cube Gambier, Nos. 1 & 2 - -	225	17.00	14.50
Gutta Percha, 1st quality - -	...	600.00	475.00
Medium - -	...	450.00	300.00
Lower - -	...	200.00	50.00
Borneo Rubber, 1st, 2nd, 3rd -	...	128.00	74.00
Gutta Jelotong - - -	...	6.87½	6.50
Nutmegs, No. 1. - -	...	48.00	47.00
No. 2. - - -	...	66.00	64.00
Mace, Banda - - -	...	90.00	85.00
Amboyna - - -	...	67.00	64.00
Pepper, Black - - -	157	31.00	30.50
White - - -	257	47.00	46.50
Pearl Sago, Fair - -	90	4.75	4.00
Medium - -	...	5.00	4.80
Large - -	...	6.20	5.80
Sago Flour, No. 1 - -	1,790	3.52½	3.40
No. 2 - -	105	3.15	1.85
Flake Tapioca, Small - -	890	8.37½	5.25
Medium - -	...	6.00	5.25
Pearl Tapioca, Small - -	175	6.75	5.00
Medium - -	960	7.00	5.40
Bullet - -	...	6.75	5.90
Tin - - - -	2,440	66.00	64.50

LONDON MARKETS.

October 19th, 1901.

Areca.—Dearer again at 52*s*. per cwt. for good clean.

Camphor.—Crude is dearer, business having been done in Japanese at 165*s*. per cwt. c. i. f., which figure the monopoly now quote Pressed is 177*s*. 6*d*., c. i. f.

Cinchona.—The shipments from Java during the first half of October amounted to 680,000 Amst. lbs., against 364,000 Amst. lbs. last year, and 657,000 in 1899.

Gambier.—All positions have been firmer recently. Spot has sold at 25*s*. The market is bare of cubes.

Ipecacuanha.—Since the auction further sales of good clean have been made at 6*s.* 9*d.* per lb., but 7*s.* is now wanted.

Nux Vomica.—A report from Calcutta dated September 26 states that owing to high prices no export sales are possible. Small ready parcels are selling at Rs. 2.10 to Rs. 2.13 per B. maund net weight, loose according to grade. Spot is very scarce, one second-hand holder of a few bags asking 11*s.* per cwt. for good.

Oil, Castor.—Belgian is easier at £28 per ton for first pressings on the spot, ex warehouse, and November-December shipment £27, f.o.b., Antwerp. Hull make for December delivery is quoted £28 for firsts and £27 for seconds, ex wharf, London. Good Calcutta seconds are obtainable at $3\frac{1}{4}$*d.* per lb.

Oil, Lemon.—Finest brands are unchanged at 3*s.*, c. i. f. and up ward but less-esteemed makes are tending downwards.

Quinine.—Last week the second-hand market closed rather dearer with a fair business for December delivery at 1*s.* 2*d.*, and March 1*s.* $2\frac{1}{4}$*d.*, and these prices were maintained until Wednesday, when the announcement unexpectedly large bark shipments from Java caused an easier feeling and to-day sellers quote December at 1*s.* $1\frac{1}{2}$*d.* and March at 1*s.* $1\frac{3}{4}$*d.*, and spot 1*s.* $1\frac{1}{4}$*d.*, without any important business.

Black Pepper.—The market is rather lower on the spot, and only very small sales made at 6*d.* to $6\frac{1}{16}$*d.* per lb. for fair to good fair, Singapore. For arrival no business reported.

At public sale on Wednesday, of 50 bags, Singapore, offered 5 bags sold at at 6*d.* 193 bags, Penang, and 69 bags, Trang, retired. Singapore is very quiet to-day, no sales reported; prices unchanged.

Tellicherry sold to arrive at 57*s.* 6*d.* per cwt. c. i. f., delivered weights, Liverpool, December-February (S).

White is steady with sales to a fair extent on the spot at $9\frac{3}{16}$*d.* to $9\frac{1}{4}$*d.* for Singapore, $9\frac{1}{16}$*d.* to $9\frac{1}{8}$*d.* for fair Siam, and $8\frac{3}{4}$*d.* per lb. for fair Penang. To arrive a firm tone prevails, but transactions are restricted to 20 tons, Singapore, October-December (S) at $9\frac{3}{8}$*d.* per lb.

At auction on the 6th instant 147 bags, Penang, were withdrawn.

Ginger (Cochin.)—A continued improvement in the tone of this market can be reported, and values have further risen. Since our last about 1,500 bags have sold privately at 42*s.* 6*d.* to 43*s.* for medium and small washed rough Cochin, and 40*s.* per cwt. for rough Calicut sorts. Under the hammer 160 cases 401 bags were offerred, but only 36 bags sold fair, medium and small washed rough at 43*s.* per cwt.

African—80 bags clean small and ends bought in at 40*s.* per cwt. Jamaica—45 barrels ordinary middling washed realised 40*s.* 6*d.* per cwt.

Cardamoms.—In fair demand at slightly easier prices. The following were the sales:—Ceylon-Mysores, extra bold pale heavy, 3*s.* 6*d.*, medium to bold pale, 3*s.* to 3*s.* 1*d.*, bold me-

dium pale, *2s. 9d.* to *2s. 11d.*, medium pale, *2s. 5d.* to *2s. 7d.*, long pale lean, *2s. 3d.*, medium brownish, *1s. 9d.*, bold splits, *1s. 9d.*, small pale, *1s. 7d.* to *1s. 9d.*, very small ditto, *1s. 3d.* to *1s. 5d*, small splits, *1s. 2d.* to *1s. 4d.*, and brown splits and pickings, *1s. 3d.* to *1s. 5d.* Ceylon-Malabar, small and medium, *1s. 4d.* Six cases of medium brown Tellicherry sold without reserve at *1s. 10d.* per lb. Decorticated seeds brought from *1s. 10d.* to *2s. 4d.* per lb.

India Rubber.—A considerable business has been done throughout the week, and prices are ¼*d.* to ½*d.* per lb. higher for fine, closing quiet. Hard fine Para at *3s. 7½d.*, soft fine at *3s. 6¼d.* Negroheads are steady; scrappy *2s. 8d.* to *2s. 8¼d.* Island *1s. 11d.* to *2s.*, Cameta *2s. 1d.* per lb. Peruvian, ball *2s. 5½d.* to *2s. 6d.*, and large sales of slab at *2s. 1d.* per lb. There have been sales of medium qualities at about steady prices. No auctions to-day.

Spices.—There has been more speculative business in Zanzibar Cloves than for some time past, otherwise there is not much requiring notice. Cochin Ginger is steady; at auction on Wednesday medium cut sold at *70s.* to *72s. 6d.* per cwt., but the other descriptions were bought in bold rough at *50s.*, tips at *46s.*, washed rough at *41s.* to *44s.* for slightly mouldy and wormy to fair, and at *42s.* for Callicut brown rough. Sales have been made privately at *43s.* for washed rough Cochin, and at *40s.* for Calicut brown rough. Jamaica sold at *40s.* to *40s. 6d.* per cwt. for ordinary dull, and at *44s.* to *46s. 6d.* for dull washed. Penang Cloves partly sold at *7¾d.* per lb. for good fair picked. A large speculative business has been done in Zanzibar Cloves at prices rising from *3¾d.* to *4d.* per lb., but on Wednesday the market was easier, and the prices declined to *3⅞d.* Japan Chillies were partly sold at *44s.* per cwt. per cwt. for good red, slightly mouldy. Pimento steady, ordinary to fair sold at *3⅛d.* to *3¼d.* per lb.

Nutmegs quiet, Penang 80's. sold at *1s. 4d.* per lb. Mace slow, Penang pickings were bought in at *1s. 3½d.* and thin red Singapore at *1s. 5d.* per lb. Cinnamon sold at *7½d.* to *8½d.* per lb. for quillings, cuttings and pieces, and at *3¾d.* to *3⅞d.* for bold chips, ordinary small being brought in at *3d.* per lb. Pepper quiet, Singapore black is quoted *6d.* per lb. on the spot. Singapore white is worth *9⅛d.* and Penang *8¾d.* per lb.

The Weather.

The rainfall throughout the Colony and Federated Malay States varied a good deal. Thus while in Singapore we had a fall under the average (7.51.) Penang considerably exceeded the average with 26·53. Malacca recorded 7.16 only. In Perak the greatest fall was at Parit Buntar, 13.77. and the lowest at Batu Gajah 5.23. In Selangor and Pahang there was about the same difference as in Perak. Rawang having a fall of 13.96. and Kuala Selangor 7.52. Kuantan 15.37 and Bentong 8.02.

Singapore.

Abstract of Meteorological Readings for October, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Minimum in Sun.*	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·894	319·9	79·8	87·1	73·7	13·4	76·9	·869	74·8	80	S.S.W. S.W.	7·51	2·13

* Max. in Sun 153·3

K. K. Hospital Observatory,
Singapore, 14th November, 1901.

A. B. LEICESTER,

Assistant Surgeon and Meteorological Observer.

Penang.

Abstract of Meteorological Readings for October, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest rainfall during 24 hours.
			Mean dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins	ins.
Prison Observatory ...	29·869	135·7	78·8	88·2	72·8	15·4	74·7	77·8	69·4	74	South.	26·53	3·18

G. D. FREER,

Colonial Surgeon, Penang.

Penang, 9th November, 1901.

Malacca.

Abstract of Meteorological Readings for October 1901.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulk.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital.	29·807	150·4	82·4	88·0	68·4	19·6	81·1	1·048	56·0	94	N.	7.16	1·30

Malacca, 7th November, 1901.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1901.

District.	Maximum in Sun.	Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall.	Greatest Rainfall in 24 hours.
Taiping ...	156	81·39	93	71·50	21·50	76·28	·838	78	9·38	1·84
Kuala Kangsar ...	...	79·89	92	71	21	76·09	·851	83	5·76	1·60
Batu Gajah ...	163	80·35	93	70	23	76·55	·863	84	5·23	1·38
Gopeng ...	...	79·49	92	66	26	75·65	·867	83	6·01	·95
Ipoh ...	...	79·98	92	70	22	76·02	·845	82	6·32	1·27
Kampar ...	...	...	91	69	22	...	...	...	5·59	1·37
Telok Anson ...	...	80·78	93	71	22	76·61	·861	82	6·62	2·40
Tapah ...	..	80·37	94	68	26	76·22	·850	82	5·67	1·16
Parit Buntar ...	...	81·18	92	72	20	77·05	·874	83	13·77	2·27
Bagan Serai ...	...	80·42	90	72	18	77·49	·904	87	12·72	2·39
Selama ...	...	80·33	91	72	19	76·52	·864	84	11·17	1·65

Taiping, 9th November, 1901.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·866	148·3	80·4	90·3	72·1	18·2	76·5	0·834	73·8	80	Calm	9·48	1·78
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	10·52	2·50
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	10·26	2·00
,, Klang	...	...	...	85·7	74·3	11·4	...	...	...	...	...	8·78	1·22
,, Kuala Langat	...	...	...	85·2	72·5	12·7	...	...	...	...	...	13·23	2·95
,, Kajang	...	...	...	85·0	76·0	9·0	...	...	...	...	...	10·81	3·50
,, Kuala Selangor	...	...	...	85·8	75·3	10·5	...	...	...	...	...	7·52	1·20
,, Kuala Kubu	...	...	...	89·2	72·2	17·0	...	...	...	...	...	15·37	2·74
,, Serendah	...	...	...	90·5	77·5	13·0	...	...	...	...	...	13·45	2·80
,, Rawang	...	...	...	85·4	73·5	11·9	...	...	...	...	...	13·96	2·97
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	12·41	5·14

STATE SURGEON'S OFFICE,
Kuala Lumpur, 13th November, 1901.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis - -	...	...	...	94·5	70·5	20.3	...	...	...	...	...	9·55	1·50
Raub - -	...	...	...	92·0	70·0	17.51	...	...	...	...	...	7·68	1·26
Bentong - -	...	...	...	90·5	66·0	24.5	...	...	...	...	...	8·02	1·33
District Hospital, Pekan	...	...	...	93	71	16.7	...	...	...	...	...	10·64	2·50
Kuantan - -	...	...	...	89	71	18	...	...	...	...	...	15·37	4·88

RESIDENCY SURGEON'S OFFICE,
Kuala Lipis, 13th November, 1901.

P. N. GERRARD, M. D.,
Residency Surgeon, Pahang.

No. 4.] JANUARY, 1902. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commerical value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN
OF THE
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FEDERATED MALAY STATES.

No. 4.] JANUARY, 1902. [VOL. I.

THE TIMBERS OF THE MALAY PENINSULA.

Continued.

Leguminosæ.

A large order, chiefly of shrubs, herbs and climbers of no value as timbers, together with a number of trees some of which are among our most valuable woods.

Millettia atropurpurea, Benth. Tulang Daeng.

A big tree with purple flowers and large pods and seeds. Timber of little value dark brown, poor. (Maingay under the name Russak describes the wood as very pale lemon and hard, probably the description applies to one of the real Russaks *Vatica*). The Malays say it is quite worthless, and that it derives its name (Fish bones) from the fact that it is only fit to throw away. Common all over the Peninsula.

Erythrina stricta, *E. lithosperma*, Miq. and other species,

are often cultivated as shade trees, and for growing pepper on. The wood of these trees is soft and white, and considered useless here even as firewood. *E. indica, Lam*; is said by Gamble to be used for light boxes, trays, toys, etc. Weight 17 lbs. to 26 lbs. The various specious are known as Dadap.

Pongamia glabra, Vent. Kachang Kayu Laut, Malapari.

A sea-shore tree with pink flowers, usually short and irregular in growth, but sometimes attaining a height of about 40 feet. The wood is white or reddish, moderately hard, not durable. It is used for cart wheels, and oil mills in India, and in house building here, but is of little value.

Pterocarpus indicus, Willd. Angsana, Sena.

A large tree attaining a great thickness of stem but not lofty, well known as an ornamental tree here of fairly rapid growth, and propagated either from seed or from large cuttings, about an inch. through. Trees of very large size may be seen in and about the older towns and villages, such as Penang, Malacca and Kwala Selangor and it may be wild in Malacca. The wood is brown,

sapwood lighter, with large irregular rings, pores mixed large and small with a row of large ones at each ring, the rays very fine and close, the concentric lines are distinct very fine and wavy. It is fairly hard, softer when fresh, and cuts very well and can be readily carved. It is said to be as hard as teak which it much resembles but much heavier. Weight 43 lbs. to 60 lbs. (Gamble) S. 45 lbs. to 53 lbs. 5 ozs. Used for furniture, also carts and gun carriages in India.

This tree is well worth planting. It grows readily, attains a large size in a reasonable time, and should become valuable. It appears to be distinct from the Padouk of the Andamans, *P. dalbergioides*, Roxb. with which it has been confused.

Ormosia.

There are seven species of trees of this genus here, but most are very local, all are of fairly large size some very large and handsome trees with panicles of white or pink flowers, short round pods with a single scarlet or scarlet and black seed, in each.

O, microsperma, Bak.,

has heavy light brown glossy wood with fairly distinct rings, and large pores in short rows, two and three together surrounded by lighter coloured woody tissue, rays slender scattered. A very pretty wood, not only on account of its glossy bright colour, but also from the light coloured patches round the vessels contrasting with the darker wood, giving it a good figure. Weight 44 lbs. 11 ozs., occurs in Singapore, Malacca and Perak.

Cassia siamea, Lam. Sibusuk, Busuk-busuk, Guah hitam, Jual.

A small tree with yellow flowers, and long flat pods. It grows rapidly but is usually short lived here, frequently dying before it produces any heartwood. The sapwood of which there is a large proportion is soft white and useless except as firewood. The heart wood is dirty blackish olive durable hard, and fairly heavy, with rather large pores connected by concentric bands of yellow wood, alternating with black or nearly black bands, rays fine light coloured. Weight 52–58 lbs. (Gamble) S. 36 lbs. to 52 lbs. 5 ozs.

Wood for building, beams of 5-6 inches square may be had sometimes, for mallets, helves and walking sticks in Burmah (Gamble) bridges, etc. in Java. It is also said to give a red dye used in the Peninsula for tanning.

C. nodosa Ham. Turukop bumi.

A taller tree with pink flowers, attaining a height of 50 or 60 feet, has white sapwood, soft and useless, the heartwood is said to be darker coloured, but not as good as that of the preceding.

C. fistula, L.

Sometimes planted, is a moderate sized tree, the wood very durable, good for posts, carts, rice pounders etc. but seldom large enough for timber, (Gamble). In Java it is said to last longer in the ground than Teak and to be untouched by insects. (Van Eeden).

Cæsalpinia Sappan, L. Sappan Wood.

A small thorny tree occurring along river banks in Pahang and elsewhere. It is raised readily from seed, and grows fairly fast, springing up again when cut down. Sapwood white, heartwood dark red, hard. Weight 38 lbs. 8 ozs.

It is chiefly known as a dye-wood, for which it is sometimes exported but also is used for cabinet work, in Java (Van Eeden.)

Peltophorum ferrugineum Benth. Batai, Alai.

A very handsome tree about 40 feet tall with yellow flowers, common in Malacca.

Sapwood white, heartwood red strong and said to be nearly as good as Merabau, for building and boats, giving beams 5 to 6 inches square. The heartwood also gives a dye used for dyeing cloth. I have never seen trees of any great size and it is apt to branch rather low and irregularly so as not to give timber big enough for beams of full size. The wood of a specimen grown in Singapore is pale reddish, fairly heavy with very fine and close rays, pores in rows medium size, and distinct rings.

Koompassia malaccensis, Maingay. Kumpas.

A gigantic tree with smooth grey bark and buttresses. It attains a height of over 100 feet and a diameter of stem of 5 feet or more. It is very common, and is often left by jungle clearers on account of the hardness of its wood and may be commonly seen standing in cleared ground when all the rest of the forest has long disappeared.

The timber is usually reckoned to be worthless except for charcoal, of which it supplies an exceedingly good quality. It is commonly stated that the wood splits on exposure and becomes useless. NEWTON states that the wood was formerly in great request and much esteemed, and mentions that the tie-beams of the Singapore Town Hall were made of this wood and in 1879 were found to be riddled by termites. He states that it possesses considerable stiffness and transverse strength. Malays say that it will not stand changes of wet and dry, that is to say exposure. At the same time, its fine colour and figure would make it suitable for furniture and in door work. Certainly it will last for an exceptionally long time under very unusual circumstances. I have seen old stumps which must have been felled many years ago and yet are even now too hard to cut with the axe. And in making an excavation for a pond in the Gardens there was found imbedded in mud some feet below the surface a Kumpass tree which though black was yet hard enough to give some trouble to cut. This ground had been forest some fifty years ago and as this tree had been covered with a deep layer of blue mud, on which a good deal of vegetation had grown, it must have fallen some years previously. Another illustration of the durability of this wood may be seen in an old stump about 10 feet tall in the Botanic Gardens. This is the remains of a tree which must have heen felled years ago, before the founding of the Gardens. Parts of it are still so hard that they turn the edge of an axe, and where it can be cut the

colour and hardness are as good as in a freshly felled tree. A sample of wood obtained in Klang at a depth of 92 feet below the surface, proved to be a portion of a Kumpass tree still retaining its structure.

The wood is hard and heavy red with rather coarse grain, the rings distinct, the pores large arranged in groups surrounded by lighter coloured tissue.

In some respects it resembles Merabau, but is coarser and more ornamental than that wood. Neglected as it is now, I believe that it will eventually come into use again. Weight 47 lbs. 14 ozs ; 52 lbs. 14 ozs. 54 lbs.

K. parviflora Prain. Tualang or Sialang.

Is more remarkable for its size than anything else. It attains a height of over 100 feet, and I have seen in Province Wellesley trees measuring 8 feet in diameter.

DIALIUM. Kranji.

There are several species of this valuable genus in the Peninsula, but though formerly it appears that the Kranji trees were abundant, they have been so sought for that it is quite rare now to find the timber in the market at all. In the earlier days of Singapore great quantities of this timber was felled, and shipped to China. There are seven species recorded from the Peninsula, all are large trees, and though the timber is not of equal value in all, yet all may justly be considered in the first rank of hard woods. The flowers are very unlike those of most Leguminosæ in appearance dull coloured and small, in large panicles with no petals and only two stamens. The fruit is a round black pod, usually velvety containing a single hard seed enclosed in a sweet, pleasanlty flavored white pithy endocarp, which is eaten by the natives for which purpose the dried pods are often sold in the markets. The tree when fruiting suffers much from the attacks of monkeys which destroy often nearly the whole crop of fruit before it is ripe, and this and the demand for fruit by the natives probably militates a good deal against the re-afforestation of our jungles with this most valuable timber. The trees are of slow growth like most hard wood trees. The timber is very similar in all the species, dark brown, and heavy and almost indestructible, the pores are usually rather large and numerous, the rays very fine and close, the rings of growth often obscure, but there are in most kinds close very fine rings as fine as the rays making a kind of check pattern with them.

Laslett (Timber and Timber trees p. 137) says that Red Kranji of Borneo is exceedingly tough and one of the strongest woods we are acquainted with taking a very heavy strain and breaking with an unusually long fracture. One piece tested for tensile strength proved equal to a strain of 10,920 lbs. on the square inch. What species of *Dialium,* this was he does not say but several occur in Borneo.

D. platysepalum Baker. Keranji Sepan, K. papan K. sekalat, K. tembaga.

A big tree 50 to 80 feet tall about four feet or more through, buttressed.

Leaves about a foot long with 5 or 7 leaftets about 5 inches long dark green above and golden silky beneath, Pods black velvety.

It occurs in Malacca and Perak.

The wood is of a deep mahogany colour with conspicuous waved rings, very fine rays close and numerous, and equally fine concentric lines, pores rather large much broader than the rays.

This is considered the best of the Kranjis and is a very beautiful wood very hard and heavy. Beams 5 to 8 inches square can be had and it is used for house and boat building. Weight 66 lbs. 11 ozs.

D. Wallichii, Prain.

Is a very similar tree in appearance but the leaves are very much smaller only 2 inches long. It occurs in Singapore and Malacca. And attains a height of about 50 feet and a diameter of about 3 feet, the bark is grey, and it has buttresses.

D. ambiguum, Prain. Kranji Burong.

This is also closely allied to *D. platysepalum* and is possibly only a variety.

In NEWTON'S collection are specimens of Kranji Burong wood in which the texture is more close grained and regular with less conspicuous rings, and the pores are arranged in short rows parallel to the rays, the concentric lines are broken up also into short pits.

D. Maingayi, Bak. Kranji Umbut, Kranji Darat.

Is a tree of 60 or 70 feet tall, the leaves of which are about five inches long with elliptic leaflets narrowed to a point and not golden beneath but green on both sides.

The timber has well marked concentric lines as broad as the rays, the pores rather large and numerous.

Weight 18 lbs. 6 ozs.

D. sp. Kranji Batu.

A very close grained wood rather lighter coloured, with obscure rings, very numerous pores and no concentric lines.

This is the Kranji of Howard Newton's paper. He calls it *D. indicum,* and it is possible it may be *D. indum* which, however, is a much scarcer tree than the others. It is a very fine hard compact timber. Weight 71 lbs. 10 ozs.

Saraca. Talan, Gapis.

There are a number of species of these showy trees scattered over the Peninsula. Some attain a fairly large size, about 30 or 40 feet. The wood is moderately heavy, but is poor and useless.

Cynometra inæqualifolia, Gray. Bulankan, Malankan Katong.

A big tree sometimes attaining a height of 200 feet, but usually at least much smaller. Wood hard, strong and durable, heavy, red,

used for beams, which can be had 5 or 6 inches square, used in house building.

Tamarindus indicus, L. Tamarind, Poko Assam.

Often cultivated for its fruit, but seems here to thrive only near the sea. It attains a large size. Wood yellowish white sometimes with red streaks, heartwood darker brown, highly prized in India, but difficult to work. Used for wheels, furniture, oil mills, sugar mills, turning, etc.

Weight, sapwood 61 to 63 lbs., heart-wood 80–83 lbs. (Gamble).

Sindora Wallichiana. Benth. Saputi.

A vast tree with flat spiny one or two seeded pods. Wood light coloured yellowish, with rather small pores and fine rays. A fairly good timber. Weight 42 lbs. 3 ozs.

S. velutina, Baker. Saputi Jantan.

A big tree, with pale lemon wood, coarse grained, hard, splits deeply in drying, used for beams in houses. Weight 50 lbs. 8¾ ozs. (Maingay.)

S. coriacea, Prain. Saputi Minyak.

This differs from the other species of the genus in having smooth spineless pods. It is not very common but occurs in Penang and Malacca.

Wood hard and heavy light brown shining, pores rather large scattered not very numerous, rays fine and close reddish coloured showing on a longitudinal section as spots and bars.

Weight 40 lbs. 12 ozs. (Maingay) S. 49 lbs. 6 ozs. A pretty wood suited for building, furniture etc.

The tree is said to produce an oil, which is used to mix with minyak keruing.

Afzelia.

There are two species of this genus here, *viz: A. palembanica*, Merabau and *A. retusa*. Kurz, Merabau, Bakau.

The latter is a small tree often only a shrub which grows commonly along the sea-shore. It is too small to be of much use, the wood, however, resembles that of *A. palembanica*, but is more regular in grain and has much smaller pores. The tree is easily recoginsed by there being never more than four leaftets on the leaf, whereas the true Merabau has from 8 to 12. Weight 22 lbs. 8 ozs.

A palembanica, Gray. Merabau.

(The native name is often spelt in every conceivable way such as Mirbow, Merbau, etc. and the Chinese sawyers have converted it into K'labu).

The tree attains a height of 100 to 150 feet or even more with a diameter of 3 to 4 feet. Strong buttresses are produced at the base in large trees. The bark is brown shedding in round flakes in an irregular manner, often looking as if some one had been bruising it with a round ended hammer.

When felled it shoots up again from the base, even if the tree

has been of large size. It is a very slow grower, and large sized trees may be reckoned to be a century old at least.

The tree is very easily identified by its large leaves 6-8 inches long bearing from 8 to 12 rather stiff rounded leaflets; the flowers in panicles white, the pods green about a foot long almost woody, and tough, rather thick though flattened, and about three inches across.

The Merabau is readily raised from seed, and for afforestation owing to its large size the seed can be planted in situ. The seed germinates very readily as a rule, but some remain for months after planting before they germinate. The first growth is very rapid, then the growth is much slower. Trees of about 15 years age in the Botanic Gardens have attained a height of about 30 feet and a girth of 2 to $2\frac{3}{4}$ feet. These trees have not at this age begun to flower yet. A full grown tree fruits very heavily, and produces great quantities of seed.

Merabau occurs abundantly in Selangor and Perak, Malacca (scantily) and as far north as Siam. It is absent from Singapore and Penang, and rare or absent also from Johor, the Dindings and Pahang.

In spite of its name it would appear that it does not occur in Sumatra, the *Intsia palembanica,* Miq. from which Baker took the name *Afzelia palembanica* being a distinct plant and Dr. Prain proposes the name of *Afzelia Bakeri* for our Merabau.

The wood is hard and heavy very durable, dark brown, and taking a good polish, the pores are rather large and corky scattered or more or less in lines, rays very fine, concentric lines usually conspicuous fine and distant.

Weight	1	Trade sample Singapore	50 lbs. 5 ozs.
		Lingga	54 lbs. 4 ozs.
		Malacca...	56 lbs. 4 ozs.
		Johor Sawmills ...	58 lbs. 3 ozs.

Merabau is one of our most useful woods, and indeed the most important timber in the country. It is the best for sleepers, and excellent for building purposes and for furniture. For sleepers alone as the railways are being pushed on through the Peninsula the consumption of Merabau will probably be very large. The following calculation was made for a report on the Selangor forests, as to the amount required for railway sleepers. Each sleeper measures 6 feet long by 9 inches wide and $4\frac{1}{2}$ inches thick and contains approximately 2 cubic feet, one mile of railway requires 1,980 sleepers. A large sized Merabau tree may be estimated to give a log of 60 feet long and four feet through, which is the equivalent of 188.50 cubic feet, so that one mile of railway requires 21 trees of the largest size. Taking the average duration of the sleepers at 8 years, 42 trees of the largest size will be required for a mile of railway in 16 years. This is much under estimated as comparatively few trees give as much timber as this and waste has not been allowed for, but it gives a fair idea of the deducted amount required for railway sleepers.

Parkia speciosa, Hassk. Petai.

A tall elegant tree with feathery foliage, flowers in club-shaped heads on long hanging peduncles, pods green thin, eaten by Malays. Attains a height of 100 feet. Wood fairly heavy but not very hard, pale reddish fawn colour, rings not very distinct, pores large and smaller mixed scattered, not very numerous, rays distinct fairly fine red, on a grey ground in transverse section.

Not much used as it is not durable, except for boxes and such work. Weight 40 lbs. 8 ozs.

P. Roxburghii, Don. Kurayong, Gudayong, Kadaong.

A similar tree with much thicker pods, the seeds of which are used in medicine, is doubtfully wild here. It attains a height of about 60 feet, with smooth grey bark, the heart-wood is brown and fairly heavy, not durable.

Adenanthera pavonina, L. Saga.

A big tree often planted, 20–50 feet tall.

Wood dirty white with large pores often sub-divided. Heart-wood red. Weight 55-56 lbs. (Gamble), S. 30 lbs. 12 ozs. to 33 lbs. 15 ozs. Used in cabinet making and for building in India and Java.

A quick growing tree, good as a shade tree or for rapid afforesting.

A. bicolor, Moon.

Somewhat similar to the last. Common but usually planted. Wood dirty white becoming brownish towards the centre, hard, does not split. Weight 56 lbs. 10 ozs. (Maingay).

Enterolobium Saman, Prain. *Inga Saman*, Willd. Rain tree.

Attains a great height in good soil, 60 to 80 feet. Commonly cultivated as a shade tree. Wood light with much soft white sapwood. Heart-wood brown not very hard, pores rather large arranged in concentric rows 2 or 3 or more together and surrounded with lighter softer tissue, rays very fine and fairly close.

Weight 28 lbs. 11 ozs. to 46 lbs. 3 ozs.

A fairly good wood, though it is not very durable and seems not to be used even as firewood.

Mimosa sepiaria, Benth.

A large thorny shrub, introduced from South America, and now thoroughly established in Singapore. Of very rapid growth in damp soil, and very difficult to eradicate, springing up again and again after being cut down, and forming dense thickets.

Wood heavy and hard, not easy to split when dry, red with fairly large numerous scattered pores, rays fine, rings very indistinct. Weight 78 lbs. 12 ozs. Only used as firewood for which it is excellent but becomes hard to split if suffered to get dry and should be split when fresh cut.

Hymenea Courbaril, L. Gum Animi.

A big tree introduced from South America, has fairly rapid growth. Trees in the Botanic Gardens 15 years old have attained

a height of about 70 feet and a diameter of 1½ feet. The wood is hard and heavy light brown showing rings corresponding to the years of growth. Sapwood a little softer and whiter, rays rather broad very close, pores mediocre.

It is raised easily from seed and might be worth planting for its timber.

Albizzia moluccana, Miq.

An introduced tree often cultivated for shade, very rapid growth and throwing up root suckers often at great distances from the main tree, attains a height of about 100 feet and diameter of 3 feet or more. Sapwood very large white soft useless. Heartwood hard, dark brown but very scanty, often absent even in large trees. The wood is of little value, even as firewood as it burns badly. It can be used for various household purposes.

A. odoratissima, Benth.

A much smaller tree than the last of rapid growth. Sapwood less in proportion white. Heartwood very hard dark brown. This which is not a native tree might be worth planting as the heartwood is very good and strong.

Pithecolobium lobatum, Benth. Jering.

A big tree with brown fœtid pods eaten by the Malays. Height about 60 feet, diameter 2 or more, wood soft light reddish white shining, little or no heartwood and that not very distinct, pores large.

Weight 44 lbs. 10¾ ozs. (Maingay) S. 26 lbs. 9 ozs. A soft almost useless wood, only used for coffins and firewood.

P. angulatum, Benth.

A small tree common in secondary growth and light woods, with red pods.

Sapwood pale reddish white, heartwood red shining soft light, pores large not very numerous scattered, rings distinct, rays fine inconspicuous. Weight 31 lbs. 8 ozs. A poor useless wood.

P. clypearia Benth.

A very similar tree with soft light wood, is used for sheaths of weapons according to Van Eeden.

P. microcarpum, Benth. Petai Belalang, Kurdas.

A common small tree. Wood soft and white, more or less reddish, heartwood redder and a little heavier, splits when drying, shining, pores large, rays very fine and close. Weight 28-30 lbs. 6 ozs. Very poor wood.

P. bubalinum, Benth.

A fairly big tree. Wood like that of the other species but rather harder, used for planking and said to be durable.

P. affine, Bak. Lulai merah, Bonga.

About 30-40 feet? Wood heavy dark brown used in building but not durable.

P. bigeminum, Mart.

A big tree, not native, with black sweet eatable pods. Wood brown moderately hard, rings distinct irregular, pores large, subdivided crowded along the rings rays fine, a fairly heavy wood, resembling Angsana, (*Pterocarpus*), better than the other species of the genus. According to VAN EEDEN, not durable, only used for props and piles and soon destroyed by insects. Weight 48 lbs. 8 ozs.

ROSACEÆ.

This order is by no means largely represented here and there are only three genera which give timber of any size. Among these however, is one of the most important timbers we possess:

Pygeum oblongifolium, Hook, fil. Balau, Johor Teak.

A very large tree 60 to 100 feet in height with broad green stiff leaves with white backs, rather small white flowers produced in panicles and large brown woody fruits. The bark is smooth and grey. The wood when fresh cut is light yellow becoming orange and eventually dark brown with age. It has a peculiar and pleasant resinous odor when fresh cut, something like that of plumwood. It is very heavy and close grained with very fine close rays and very small pores with no corky margins, very numerous, no rings. It is a very durable wood seldom attacked by termites, and not liable to destruction by fungi unless when covered so as to obstruct free currents of air. It splits but little, and is fairly but not excessively hard, so that it cuts readily and well. It is very valuable for beams and house building generally. The tree is unfortunately now scarce. I have seen scattered specimens in Singapore, Johor, and from Pahang. HOWARD NEWTON gives Borneo as a locality which may be doubted. It is, however, in any case very local and owing to the great demand for it has been almost exterminated. NEWTON states that formerly much was exported to India, China and Australia, and also to Ceylon where it was used in the Colombo Breakwater.

As it has now become scarce several very inferior woods are often passed off for it. It has been noticed that modern Balau has by no means the durability of the old Balau, and it is also considerably lighter. Thus Balau beams used in the plant house of the Botanic Gardens, for eighteen years when removed were for the greater part sound and strong, the ends where covered by other timber and exposed to dampness, alone had decayed. Beams, however, used later in another building in Singapore and not exposed to rain were found to be destroyed in five years. These though stated to be Balau were probably not the genuine timber. The wood most often supplied as Balau now differs in the pores being larger with corky margins, and often divided, there are distinct rings very fine and often very fine transverse lines. The grain is rather coarser and the wood is ligher. It appears to be a species of *Shorea*.

The weight of specimens of Balau in the collection of Singapore woods are 67 lbs. 15 ozs. and 64 lbs., while the other timbers class-

ed as Balau which are evidently different, are Kemaman 56 lbs. 4 ozs.; Johor, 47 lbs. 13 ozs.; Trade sample from Singapore 50 lbs. 12 ozs. and 52 lbs.

Balau bunga, is a somewhat similar but inferior wood. From what tree it is derived is not yet known it is light coloured and fairly heavy.

Pygeum polystachyum, Hook. fil.

A medium sized tree attaining a height of 60 feet, bark thin grey wrinkled, large round leaves, and greenish flowers. It is common in Singapore. The wood is fairly hard and rather light, close grained and pale brown in colour, rather spotted, the pores often divided small and the rays fine, not close, brown.

It is not a first class wood, but fairly good. When cut the tree exudes a clear gum.

P. maingayi, Hook. fil.

Not a common tree, occurs in Malacca and Perak. The wood is pale olive white with brownish striæ and gamboge coloured stains, grain coarse, medium hard; splits in drying, used for beams. Weight 47 lbs. 6¾ ozs. (Maingay).

Parastemon urophyllum, Dec. Malas.

A good sized tree with a fairly thick stem and ovate lanceolate leaves, usually found near the sea on sandy heaths. The wood is hard and heavy dark brown with a wavy fibre, and the pores of medium size. A good useful wood.

Parinarium Griffithianum, Benth. Merbatu Layang, Sunko Bimau.

A large tree, 70 to 80 feet tall with deep green leaves and white flowers, not very abundant. Singapore, Malacca and Pahang. "Wood red with light markings, grain medium fairly hard splits very slightly in drying, durable. Weight 49 lbs. 8 ozs." Maingay.

A good timber (Van Eeden) used in building, giving beams 5 to 6 inches square.

P. nitidum, Hook fil, Merbatu Merah, Medang Kawan.

A medium sized or small tree 30 to 40 feet tall. "Wood faint reddish grain medium, hard, fairly heavy, splits very slightly in drying" light brown with very few small pores concentric lines well marked wavy very close, rays very fine. Weight 69 lbs. 6½ ozs. (Maingay) Penang 69 lbs. 3 ozs.

P. costatum, Bl. Sukupal.

A big tree 60 feet or more tall, wood heavy, used in building giving beams of 5 to 6 inches square, durable.

INDIGO.

A Consular report on the trade of Marseilles and Lyons for 1900 states:—German artificial indigo is killing Indian natural indigo on the French market. The only possible remedy to the situation, full of peril to Indian planters, is the one already recommended in

every other industry, imperilled by Germany and the United States; combination and reform in methods. The question is very important to India, and I therefore venture to deal with the subject at some length.

Decreased Imports at Marseilles.

Indigo imports have steadily decreased in the last few years. Ten years ago the Marseilles market received 1,400 to 1,500 cases annually, whereas in 1899 direct imports did not exceed 600 cases. The import rose slightly during 1900. Of the 600 cases imported in 1899, 130 came from Java, 50 from Bengal, the remaining 420 from the coast of Coromandel. The causes of this decrease were as follows: European buyers no longer care to compete against the relatively higher prices paid by Japan and the Levant for Coromandel indigo of which they have now become the principal buyers. The few Java planters of indigo who used to send their produce here, have now completely given up the cultivation of indigo, which no longer paid, for the cultivation of tobacco and sugar. Imports at Marseilles from Bengal have almost completely ceased because, in the first instance, consumers buy from the growers direct more than they used to, small dyers receiving one or two cases direct from Calcutta during the season of public sales in that town, and lastly because the Havre market now almost monopolised Bengal indigo, on which quality term sales are based.

The above mentioned figures refer solely to indigo actually sold on the Marseilles market. Lastly, German competition in artificial indigo has already decreased the demand for natural indigo by at least 10 per cent at the close of the first year's operations of the German manufacturers in France. This proportion is bound to increase with the output of artificial indigo. The artificial dye already regulates prices. The small crops of last year, would have justified a rise in prices of natural indigo, but owing to the artificial produce put on the market, this has not taken place.

Artificial Indigo.

The researches of German Chemists, with unlimited means placed at their dispossal for that purpose, begun in 1865 by Herr Von Bayer, resulted in 1890 in the chemical production, at commercial prices, of a dye having nearly all the qualities of Indian indigo, the substance obtained being chemically similar to that produced by the indigo plant. In 1897 Herr Heuman succeeded in producing this dye to which the name of "artificial" or "synthetic indigo" was given, from a cheap chemical substance of unlimited supply, napthaline, by an easy process. One thing only appears wanting to make this dye perfect, it is not yet impervious to chlorine. But science as practised in Germany, with such eminently practical results, is expected to cope before long with this last remaining difficulty.

Two German firms are now operating in France in the Lyons district. The first to start was the Bedische Anilin und Soda Fabrik of Ludwig-shaven-am-Rhein, holders of the first patent. They established a branch house at Neuvill-sur-Saone, near Lyons,

where the dye has been manufactured for two years for local consumption. Another German firm who have patented another process, the "Farbwerke, formals; Lucius und Bruming", of Hoechstam-Main, have been selling their artificial indigo for two years to the French firm "Societe Chimique des Usines du Rhone", of Lyons. They are now manufacturing their synthetic indigo in Lyons itself. Specifications of both of these patents could be obtained in the usual way through Patent Office Agents in Paris.

Artificial indigo exported from Germany into France is classed for duty with natural indigo. In the United States for some time the artificial indigo was classed with other colouring matters extracted from coal tar, as, for instance, alizarine, aniline, which pay a high custom duty *ad valorem*. But on the representations of the German Government, this was altered to meet German demands. Artificial indigo was first launched on the French market under the name of "Indigo pure B.A.S.F." (Badische Anilin and Soda Fabrik), and the pure product is still under the same name. But for facility of manipulation, the product is sold in the form of a paste containing 20 per cent. of "indigotine", convenient for transport and use. Goods dyed with artificial indigo are not required to be declared as such. They are sold under the class of goods "dyed with indigo". They are consequently sold at similar prices to goods dyed with natural indigo. Doubtless, if the public were aware that the goods they are purchasing are dyed with the artificial dye, they would express a preference for goods dyed with the natural product, which has shown its worth by long experience.

Relative Merits of Natural and Artificial Indigo.

I have taken the opinion of several leading merchants and dyers at Lyons and at Marseilles, and give their views in as concise a form as possible. Indigo not being used in the dyeing of silk, the Lyons dyers are not specially interested in the question. But Lyons dyers of cotton and woollen goods and Lyons dealers in indigo have been consulted:—

(a).—Synthetic indigo is easily sold, and is especially appreciated by dyers when clear and pure tints are needed, as, for instance, in the printing of "Indiennes." natural indigo is advantageously replaced by artificial indigo in all cases except when carmines and sulphates of indigo are employed for ground colour, in which case natural indigo is preferable because its resin and impurities serve to cover the fibre of the cloth, and give it a metallic sheen which cannot be procured with artificial indigo. Beyond this the artificial dye is equal to the natural dye, and there can be no doubt that the production of the latter is seriously menaced.

(b).—Not only is the future market of indigo very seriously menaced, but in many dyeing establishments in France the German artificial dye has ousted it altogether. Their opinion of the synthetic indigo is that its composition is absolutely regular. This quality of uniformity in composition has the great advantage of facilitating manipulation of enabling equal shades of colouring,

almost mathematically, to be obtained. It has the advantage of greater cleanliness, whence the possibility of obtaining more beautiful tints, which it is always easy enough to tarnish, if it is desired to imitate the tones of natural indigo of inferior quality. The artificial indigo was at first used without previous preparation by crushing. With equal quantities of both products, better results were obtained from natural indigo, but the yield of synthetic indigo was found to be greatly increased if previously crushed. There was then no loss. The cost of the artificial dye sold at the price of the natural product was thereby lessened. It was also found that the same mills, hitherto employed in the crushing of natural indigo, could be used in the crushing of the German dye. The change of dye by dyers entailed therefore no additional plant.

(c).—All the small dyers in France have given up natural indigo for the reasons mentioned in paragraph *(b)*. Another advantage to them is that they can order small quantities of the artificial dye as needed, and do not require to lay in a stock and insure it.

(*d*)—Another authority informs me that synthetic indigo is easier of manipulation and more pleasing to the eye. It will gradually take the place of natural indigo in almost all cases. But as the vegetable dye gives more solidity to the cloth than synthetic indigo, it will still be used, either pure or mixed, by the great wholesale manufacturers of cloth for uniforms, Government contractors. Government inspectors are appointed to verify the nature of the dye used in the making of cloths for uniforms. There is consequently some hope of natural indigo not being altogether dispensed with. But how long this will last, in view of possible improvements of synthetic indigo, it is difficult to say. Doubtless, the dyes are already being mixed to reduce cost, The German Government is said to leave the choice of the dye to the manufacturer of the cloth.

(*e*)—The German manufacturers give the synthetic indigo the following praise:—(1) Great purity; vivid colouring. (2) Uniformity of quality. (3) Economy, as every bit of their dye can be used, whereas the vegetable dye always leaves a certain percentage of deposit, not utilisable in the dye vat. It can be employed without previous crushing; but this operation, with the old plant in use, gives still more profitable results. (4) It meets the requirements of small dyers, who can puchase it in small quantities as needed. The German manufacturers are confident that as alizarine red has taken the place of madder in the course of ten years, so their synthetic indigo will oust the Indian plant sooner or later.

This German opinion is perhaps somewhat too optimistic. I give at the close of these notes some opinions of experts on the other side; but, and this is the most important point of the whole matter, improvements of Indian methods of cultivation and preparation will have to be made. The fight will be a hard one.

Demand, Output and Prices.

The present production of artificial indigo in Germany is said on good authority to equal the natural product supplied by plantations

of 100,000 hectares (247,000 acres) in India. Germany expects to make from 50,000,000 to 60,000,000 marks (£3,000,000) value of artificial indigo per annum. The appearance of this artificial indigo on the market, chemically similar to the chemical substance extracted from the plant, brought down prices to an alarming extent. In 1897 the product containing 60 per cent. of pure indigo sold at fr.30 per kilo. (10*s.* 10*d.* per lb.), in 1883 prices came down to 20 fr. per kilo. (7*s.* 2*d.* per lb.). Prices now ruling are 17 fr. 50c. per kilo. (6*s.* 4*d.* per lb.) delivered free at consumers works. It costs the manufacturer about 10 fr. per kilg. (3s. 7*d.* per lb.) Mark the profit. The plant of the Badische Anilin und Soda Fabrik cost no less than £900,000. Acetic acid, one of the chemical substances required in the process, which is obtained from wood, is used to the extent of 2,000 tons anually. This means a consumption of 130,000 cubic yards of wood. The reader of these notes will thus be able to get a fair idea of the colossal nature of this German enterprise, the object of which is to wrest from the British Indian Empire the indigo market. With the discovery of new processes of manufacture by competing German firms, and inevitable lowering of prices will follow, which natural indigo will find it hard to cope with. But the lowering of prices will not greatly affect the German industry, for pure indigotine could be sold in France at 12 fr. per killo. (4*s.* 4*d.* per lb) at a profit. There can be no question of any rise in the prices of the substance it is extracted from of sufficient importance to cause a rise in indigotine, the supply of coal-tar being illimitable. The demand for indigotine is already very great. One of the firms mentioned, the Badische Anilin und Soda Fabrik, have sold, 1,000,000 fr. worth (£40,000) of artificial indigo in one year in France. Both firms now operating in France cannot keep pace with the demand. As I have said above, both German firms are now manufacturing their indigo in France.

Conclusions.

It must be confessed that the outlook for Indian growers of indigo appears black enough almost to warrant their following the example of the planters in Java, who have given up indigo for tobacco and sugar.

Some importers here are of opinion that the substitution of artificial for natural indigo is only a matter of time. It is to the interest of the consumers to favour a product that will put a stop to the two great variations in prices of a dye owing to the nature of the year's crop. They think that natural indigo will still hold its own for some time against its competitor owing to its durability as a fast dye. Madder had to give way to alizarine red, and cheapness, the dangerous weapon in all German competitive struggles, is an inducement very difficult to resist. If the dye will last the cloth, as in cotton print and woollen fabrics not exposed, like uniforms to sun and rain, what advantage can the manufacturer on the Continent find in a dearer though better dye, if the cheaper be more attractive to the eye and gives so much greater profit.

The Way Out For Indian Planters.

How is the German move to be met? There is a way out. It will be found in improved cultivation, on scientific principles, of the plant, and in improved methods of extracting the natural dye from the indigo plant. Considerable initiative and some outlay of capital is required. The old mechanical method of hand-and-foot labour, as handed down from generation to generation, without any thought of improvement, will have to go. The process of extracting the maximum quantity of pure indigotine from the vats is being closely inquired into by experts, I am told. Authorities in chemistry will undoubtedly succeed in obtaining increased proportions of colouring matter from the plant, which has hitherto not been expected to give more than $1\frac{1}{3}$ lbs. of indigo for 100 lbs. of the plant. At the present moment experiments are in progress in Cambodia, which will be of particular interest to indigo planters in British India. I am told that one Martinique planter has succeeded in obtaining a product containing .73 per cent. of pure indigotine at a cost of 1*s*. 1*d*, per lb. This is at a notably lower cost than that of artificial indigo, as stated above.

It is thus far from a certainty that natural indigo will disappear from the market as soon as madder did when threatened by German chemical competition. Indigo planters willing to radically alter their old-time methods, improve their cultivation of the crops and alter the mode of extraction of the dye, and who, by means of combination with official help, can, make the necessary sacrifice that the changes will entail may take heart of grace. The last word has not been said yet on the subject of natural indigo.

Dr. Calmette's Method of Extraction.

Dr. Calmette, of Lille, has patented the following process for the extraction of indigotine from the plant. Hitherto the leaves of the indigo plant have been placed in masonry vats in layers. The vats are then filled to two-thirds with water, care being taken not to crush the leaves. The leaves are held down by planks, and water is let in to cover them. Fermentation then sets in and the liquid, first yellow, becomes by degress green. The temperature of the vat rises, and soon the surface of the vat is covered by a film having a metalic scheen. In this operation "indican," the substance contained in the plant, transforms itself into glucose and white indigo under the influence of the fermentation caused by a bacillus living on the leaf of the indigo plant. The white indigo is transformed into blue indigo by simply beating up the liquid bringing it into contact with air.

A deposit of indigo flakes is formed at the bottom of the vats. It is boiled up with water, dried, and made into small cakes. The primitive method gave only about a third of the indigo contained in the plant. There is a considerable loss owing to the fermentation. Dr. Calmette has endeavoured to regulate this fermentation; he suppresses it entirely and treats the leaf in close vats at a temperature of fifty to sixty degress centigrade, unexposed to the oxygen of the air. The extraction of the "indican" and its trans-

formation into white indigo, takes about two hours under the influence of a special ferment. "Diastase," hydrating and oxydating, which exists in the cells of the leaves. The liquid is then withdrawn from the warm maceration, and is cooled with cold air by some mechanical means. The white indigo becomes blue indigo but insoluble. By these means three times more indigo is produced than by the primitive method. The indigo thus obtained is very pure, and contains from 80 to 82 per cent. of indigotine, the colouring matter of indigo.

INSTRUCTIONS FOR DRYING PLANTS.

By C. Curtis, F. L. S.

Many readers of this Bulletin will occasionally come across a plant of which they would like to know the name, and it is not so generally understood as it should be that in most cases plants can be as easily determined from dried as living specimens. There is a story told in botanical circles, of a living plant being brought to an eminent botanist which he failed to identify, but he hinted that if it were taken away and sat upon for a week he would probably be able to name it. In the case of timber trees, and other large growing plants, it is manifestly impossible to send specimens for identification, any great distance, in any other way except dried, and as there is still much to be done in collecting and determining the Forest Flora of this region it is with the hope that some at least of those who are living amid forests will turn their attention to collecting and drying plants, that I propose giving a few hints as to how to do it. A complete specimen consists of leaves, flowers and fruits, and in the case of small growing plants it is desirable to have the whole plant with the roots attached. Such specimens are not always obtainable at the same season and in that case leaves and flowers or leaves and fruits will suffice, but leaf specimens alone are seldom sufficient for determination. Whenever possible the specimens should be gathered dry, and if wet should be laid out singly for an hour or two before putting them in paper to allow the moisture to evaporate, but not long enough to allow them to wilt. In the case of fleshy plants or those that dry badly; thatis to say, those from which the leaves drop off even with the greatest care, immersion for a few minutes in spirits of wine or boiling water is a good plan. After immersion these should also be laid out singly until the moisture has evaporated.

All sorts of more or less elaborate presses have been devised for drying plants, but there is nothing better than a pair of simple wooden frames as shown in the accompanying illustration, and which I have used for more than twenty years. Each frame consists of eight pieces of any strong light wood, three-eighths of an inch thick, and two inches wide. Five of these, twenty-three inches long, are placed about two inches apart and to them nailed transversely three pieces twenty inches long. The drying paper, which should be of an absorbent kind, (there is nothing better than blotting paper

but it is expensive to use on a large scale) and about fifteen by twenty inches in size is then laid on the smooth side of the first frame and on this the specimen to be dried laid out as smoothly as possible. Alternate layers of plants and paper are continued until there are as many as it is desired to dry, or as may be considered sufficient for one press. On this pile, the other frame is now placed, smooth side to the paper, and with a long piece of string the two frames are bound together by means of the ends of the transverse bars. Sufficient pressure can be brought to bear to prevent any plant from shriveling, and this is all that is required. These presses are easily portable and can be placed in the sun or near a fire.

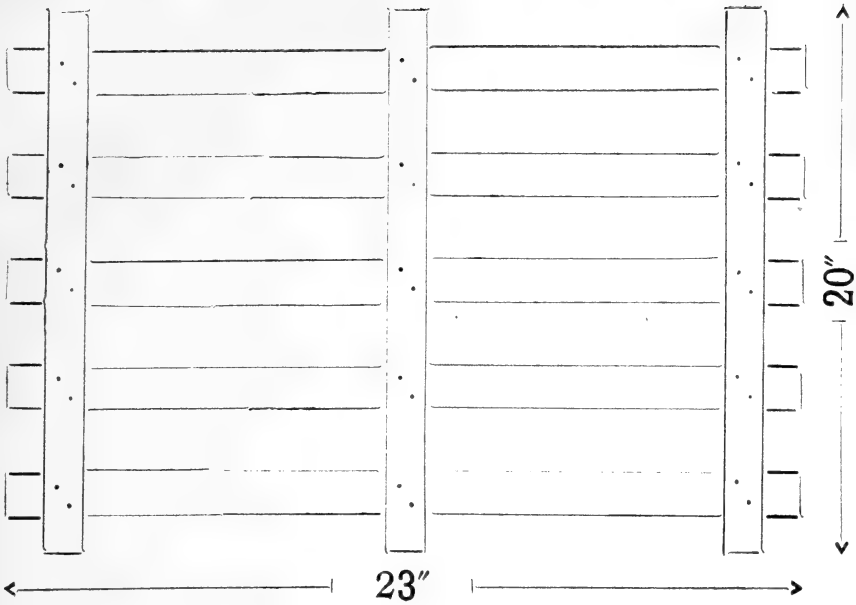
Where the means of manufacturing such frames do not exist I have often at a pinch made a serviceable imitation with split bamboo tied together with rattans or other jungle creepers. Ordinary straw coloured Chinese paper, such as is used by every Chinese shopkeeper, can also be used where no other is available, but it is necessary to use plenty of it and change often. With thick, specially prepared drying paper, two pieces between each layer of plants is generally sufficient, but with Chinese four or five at least are necessary. During the first few days the papers should be changed at least once a day and those that have been in use thoroughly dried before being used a second time, but the same paper may be used over and over again for months.

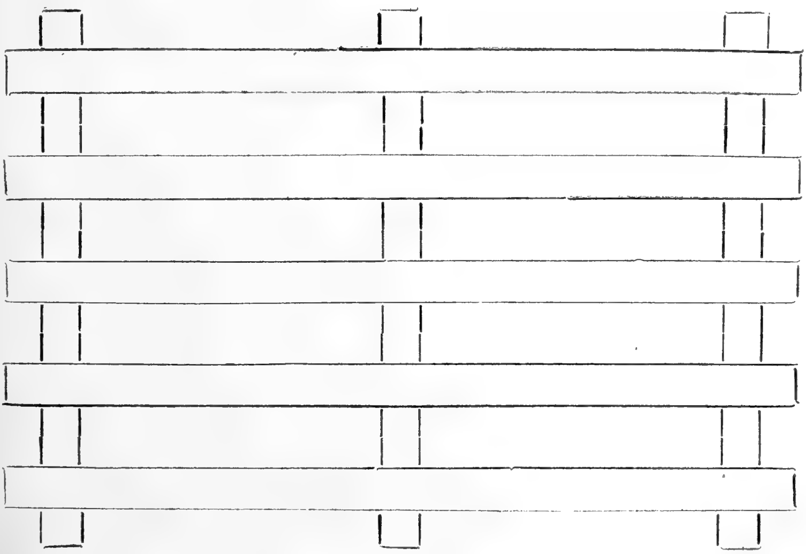
A great difference in the time required for drying will be found in the case of different plants, some things, such as Ferns, can be dried in less than a week, while soft fleshy things, such as Arums, unless dipped in spirits of wine or boiling water, will, by sun heat alone, take three times as long. If many specimens are being dried it is a good plan to examine the bundles at least once a week, and to put in one bundle those that are in nearly the same stage of dryness.

Attention to a few simple rules will ensure success in drying plants.

Do not put too many specimens in one press. Use plenty of paper. Change the paper often during the first few days. Keep the presses in the full sun or some other dry place. To dry quickly is the important point, and in very wet weather this cannot be done without fire heat. When quite dry the specimens may be kept between sheets of any kind of paper or gummed down on half sheets of stout white paper in the manner usual in botanical establishments. Equal parts of gum arabic and gum tragacanth dissolved in cold water is more convenient for this purpose than glue, which is generally recommended, as it is always ready for use and does equally well. The gum should be applied to the specimen with a camel hair brush after which it is laid on the paper and kept in position with gentle pressure until dry. The size of the sheets used in most herbariums is seventeen by eleven and a half inches and this is a convenient size.

To preserve from the ravages of insects each specimen should be brushed over with a solution consisting of spirits of wine, Cal-


20″
23″



verts carbolic, and corrosive sublimate. A little practice will enable anyone to prepare specimens good enough for identification, and once started, and the names of a few plants learned each step becomes easier and more interesting. Contributions of dried plants are always acceptable to the Botanic Gardens, both in Singapore and Penang, even though already well known, for they serve to increase our knowledge of the distribution of the species. The Malay names of even the most common plants are always acceptable for it is only by collecting these over a large area that the one most generally used can be ascertained.

It should be mentioned that to each specimen when first gathered, a slip of paper should be attached, giving particulars of the specimen on the following points:—(a) locality, (b) elevation above sea level, (c) whether tree, shrub, etc, (d) colour of flowers, and any other peculiarity noticed.

GUTTA PERCHA FROM LEAVES.

Information from various sources tend to show that the collection of Gutta Percha leaves is a more wasteful and extravagant method, and one that will sooner exhaust the supply wherever it is allowed, than the old one of cutting the trees only for the gutta in the stems, as was the custom until comparatively recently. Under the old system trees were cut much too young, but there was a point at which the collector stopped because the gutta it contained would not pay for the labour of collecting. Under the present system young saplings an inch in diameter are chopped down for the sake of the few leaves which cannot otherwise easily be got at. I am told by a gentleman who has recently been in the Rio Archipelago that this is the system there, and that there is a coasting steamer employed in going from village to village to collect the leaves and bring them to a central factory. To suppose that native collectors will, or could if they would, carry ladders in places where gutta percha trees are found naturally growing, or that they will pay any regard to the future supply, is absurd. Anyone who has studied the Palaquium trees and noted their slow growth will, I think, have doubts as to whether the plucking of leaves from planted trees is likely to be capable of practical application. In my opinion the only way in which the discovery of extracting gutta percha from the leaves can, with our present knowledge, prove beneficial is in the fact that instead of wasting the leaves of the trees that are cut down, and the gutta extracted from the bark in the usual native manner, they also are utilised.

THE DISSEMINATION OF SEEDS BY NATURAL MEANS.

The means by which seeds are disseminated in order that a sufficient number may find a suitable spot in which to perpetuate their kind are numerous and interesting, and have a practical bear-

ing for both planter and forester, but the subject is so vast that only a few instances of plants of special local importance will at present be referred to. Birds, animals, wind, water, and in some cases a volition of their own are all agencies by which the same end is attained. Birds and animals are well known to act in two distinct ways as distributing agents, one by eating and subsequently evacuating seeds, without destroying their germinating powers, and the other by the accidental attachment to their bodies of certain specially adapted kinds. There is also a third, particularly in the case of bats, due entirely to their pugnacious habits which plays, I believe, no unimportant part. As soon as one individual has secured a choice morsel one or more others make an attempt to rob him, and in order to enjoy it in peace the fruit is often carried to a considerable distance before the pulp is eaten and the seed dropped. Of the latter method gutta percha may be taken as an example.

Gutta Percha.

True gutta percha trees belong to the Natural Order Sapotaceæ, and the best kinds to the genus Palaquium (also known as Dichopsis and Isonandra). The most common Malay name for the Palaquiums is gutta taban, but in Penang it is known as Ekor, and in places in Sumatra as Balam. Payena also yields a good gutta which is known as gutta sundek. The seeds of Palaquium, of which there are generally one or two, but occasionally three or four, are enclosed in a sweet edible pulp of which birds and animals are particularly fond, especially bats, which I believe are the principal agents in the distribution of the seeds of this tree, though on this point I cannot be quite sure because precautions had been taken to prevent the access of climbing animals to the only trees I have yet seen in fruit by means of spikes of bamboo and sheets of tin. The bats however attacked them badly and carried them to considerable distances. By setting a boy to visit daily their sleeping places, which in this particular kind of bat is the under side of a large palm leaf where they are protected from sun and rain, several hundreds of good seeds were collected. I at first thought that these seeds had been swallowed and evacuated (and am not quite sure about it yet) but on considering the size of the animal as compared to that of the seed it scarcely appears possible, and moreover none were found in the intestines of those captured. Some of the resting places in which seeds were found were quite a quarter of a mile from the trees that were fruiting.

Climbing Rubbers.

Two most important Genera of local rubbers vines (Urceola and Willoughbeia) although belonging to the same natural order (Apocynaceæ) and known locally under various names such as Getah gharu, Gegrip putih, gegrip merah, Akar sampat, &c. are disseminated in quite different ways. The fruit of Urceola is a woody follicle which splits when ripe and contains numerous seeds. Each seed has an attachment of silky hairs which buoys them up and by means of which they are carried great distances. As these

vines seldom or never fruit until they have overtopped tall trees and reached the light the seeds have the advantage of starting from a considerable height. Willoughbeias on the other hand have large fleshy round or pear shaped fruits with the seeds embedded in an edible pulp of which animals are fond and which is also sometimes eaten by human beings. Their means of distribution depends mainly on animals, but growing as they often do on steep or sloping ground, the fruit if it has escaped the notice of animals and fallen to the ground will be found to have sometimes rolled a long distance before coming in contact with any obstruction.

DIPTEROCARPS.

No Natural Order of Malayan plants contains more valuable trees than Dipterocarpeæ. Besides furnishing such useful timbers as Damar Laut, Chengal, Meranti, Seraya, &c., they also furnish oils and damars. They are numerous both as regards species and individuals and most of them have winged fruits by means of which they are distributed throughout our forest area.

The flowers are mostly small and inconspicuous but soon after these have fallen and the calyx lobes, which eventually form the wings, commence to enlarge the trees are the most noticeable in the forest, some of the species in a young state being of a deep pink or reddish colour, and in others of a yellowish green. These when ripe and detached from the tree do not drop directly to the ground but descend in the position of a shuttlecock with a slow rotary motion and the distance which they travel from the parent tree before reaching the ground depends on the strength of the wind.

Seed bearing trees of this order are generally of great height and the area over which a single tree spreads its seeds is considerable. As the seeds ripen gradually they gain the advantage of any change in the wind and condition of the weather, for they require abundant moisture in order to germinate.

Sir G. KING in the Materials for a Flora of the Malayan Peninsula has described several new species but there is much yet to be done in collecting and determining the correct botanical names of the trees belonging to this important but easily recognised order.

PARA RUBBER.

The dispersion of Para Rubber seeds is effected in a manner different to either of those already referred to, and in the same way as Impatiens. When the seeds are ripe the capsules containing the seeds burst suddenly with a report that can be distinctly heard and shoot the seeds to a considerable distance. An isolated tree that recently fruited in the Waterfall Garden, Penang, afforded an excellent opportunity for observation.

Seeds from this tree which is 50-60 feet high were scattered around in all directions to a distance of fifteen paces and a few as far as twenty paces.

When one considers the little chance a seedling tree has of attaining maturity under the dense canopy of its parent which

already occupies the ground and has the advantage of possession, the absolute necessity of some means of locomotion to a more favourable site becomes evident and the lesson to be learnt, especially by the forester is not difficult of application. Where all start fair as in a plantation the conditions are entirely changed for all get a share of light and are kept clear of obstructions overhead.

CORRESPONDENCE.

Measurement of Para Rubber Trees.

To the Editor,

Agricultural Bulletin, S. S.

Inch Kenneth Estate,
Kajang, Selangor, F. M. S.

Sir,—The following may be of interest to planters of Para Rubber.

A small area was planted on this Estate in January, 1896, with Para plants obtained from the Botanical Gardens, Singapore. They are now, therefore $5\frac{10}{12}$ years old and they measure as follows at 3 feet from the ground.

	Trees.
3 feet and over 3 feet girth	18
$2\frac{1}{2}$ ... ... $2\frac{1}{2}$,, ...	33
2 ... ... 2 ,, ...	55
Under 2 feet	54
Total...	140

The largest tree measures *3 feet 6 inches.* I have no doubt that still better measurements would have been obtained had the land been kept clean. It was overgrown with weeds and lalang for about 2 years. The soil, originally swampy, has been drained and in one part where draining was neglected the trees died slowly after reaching from 2 to 3 years old. Excepting those and a few broken over by wind (these sent out new shoots and are mostly doing well) there have been practically no losses.

I see in the October number of the Bulletin Mr. Derry's estimate of girth at 6 years old is 24·30 inches.

Yours faithfully,

R. C. M. KINDERSLEY.

Agricultural Shows in the Colony and Federated Malay States.

Kuala Lumpur,
November 24th, 1901.

To the Editor,

Agricultural Bulletin.

Sir,—The suggestion thrown out by you in the first number of the Agricultural Bulletin as to the advisability of establishing some re-

gular system of holding Agricultural Shows is, in the Straits Settlements and Federated Malay States, I consider worthy of serious consideration. There can be no question as to the importance of such shows from an educational point of view, both to the European Planters and to the Natives of the country, and, as you rightly observe, one of the advantages—the chief advantage I fancy, is that Planters and those they look to for guidance, can meet and consult with one another, while the exhibits will form very good food for discussion.

Evidently the first thing to be done is to form a Committee, which should represent the various planting centres in the Straits Settlements and the Federated Malay States, and whose chief duty would be to decide from time to time, in what district the show should be held and at what intervals; but the nomination of this Committee must be left to other hands.

Hoping to draw some expression of opinion from the Planters themselves.

I am,

Yours, &c.,

S. A.

A STANDARD FOR MEASURING PARA RUBBER TREES.

Malacca, 11th December, 1901.

To the Editor,

AGRICULTURAL BULLETIN.

Dear Sir,

Might I suggest that in measuring the girths of trees if measurement were made at a Standard height of 4′ 6″ from the ground it would add greatly to the value of measurements recorded by planters and others and sent to the Bulletin for publication, 4′ 6″ from the ground is the height universally adopted at home, in India and on the Continent, *i.e.* breast height. I have myself taken hundreds of measurements in Germany in this manner, and was so instructed by Sir DIETRICH BRANDIS, former Inspector General of Forests in India. It is impossible to compare one set of measurements made at 3 feet from the ground with others at different heights. In Burma Teak trees are measured at a height of 6 feet from the ground, because most teak trees have buttresses which would give a false measurement of the tree were the girth taken lower down, by false I mean misleading. If other trees with buttresses be measured at 6′ from the ground and all others at 4′ 6″ we would have a Standard on which to have comparisons.

Yours sincerely,

A. M. BURN-MURDOCH,

Chief Forest Officer.

SINGAPORE MARKET REPORT.

for November, 1901.

Articles.	Tons. sold.	Highest for the month.	Lowest for the month.
		$	$
Coffee—Palembang	25	30.50	29.00
Bali	45	27.75	27.00
Liberian	246	21.00	19.50
Copra	2,785	9.60	8.60
Gambier	1,890	16.65	14.00
Cube Gambier, Nos. 1 & 2	205	20.50	16.75
Gutta Percha, 1st quality	...	600.00	475.00
Medium	...	450.00	300.00
Lower	...	200.00	50.00
Borneo Rubber	...	130.00	72.00
Gutta Jelotong	...	7.00	6.50
Nutmegs, No. 110's.	...	48.00	47.50
No. 80's.	...	66.00	65.00
Mace, Banda	...	90.00	85.00
Amboyna	...	65.00	64.00
Pepper, Black	193	31.00	30.50
White	113	50.00	47.00
Pearl Sago, Small	105	4.75	4.10
Medium	...	5.00	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	3,400	3.85	3.32½
No. 2	147	3.40	1.90
Flake Tapioca, Small	921	8.37½	5.25
Medium	...	6.00	5.25
Pearl Tapioca, Small	162	6.75	5.00
Medium	1,321	7.75	5.40
Bullet	....	6.50	6.00
Tin	2,869	69.50	65.50

London Markets.

From the Chemist and Druggist, November 16th, 1901.

Arrowroot.—Quiet. At auction on Wednesday all the parcels of St. Vincents were bought in at *2d.* to *3d.* per lb. for good to fine. Natal also was bought in at 7½*d.* per lb. Privately ordinary to fair St. Vincent has sold at 1⅜*d.* to 1½*d.* good at 1¾*d.* to *2d.*, and fine 2¾*d.* to 3¼*d.* per lb.

Benzoin.—There has been a good demand for Sumatra since the auctions at prices ranging from £6 to £8 10*s.* per cwt.

Camphor.—On Monday, German refiners advanced their quotations ¾*d.* per lb., and now quote ton lots of bells at 2*s.*, ½ ton lots 2*s.* 0¼*d.* and 3 to 5 cwt lots 2*s.* 0½*d.* per lb. c. i. f. English refiners are unchanged at 2*s.* 1*d.* for ½ ton lots.

Cocaine.—Hydrochloride is very firm, business having been done at makers' prices. Crude continues scarce, the Hamburg market having been cleared.

Dragon's Blood.—Eleven cases good quality have arrived this week.

Cubebs.—At the Pharmaceutical Society's evening meeting this week the Curator of the Museum exhibited a sample of false cubebs recently imported into Liverpool. They are the old thing, very like true cubebs, but do not give the characteristic crimson reaction with sulphuric acid.

Gambier.—A parcel of cubes just landed has been sold at 36*s.* per cwt. for fair No. 1.

Ipecacuanha.—Since the sales some twenty bales of Brazilian have changed hands at about the auction prices. In Cartagena no business appears to have been done, holders of good clean stuff asking 6*s.* 3*d.* to 6*s.* 9*d.*

Oil, Castor.—The quotation for Calcutta seconds is 3¼*d.* per lb. Hull make for December delivery is quoted £28 for firsts and £27 for seconds, ex wharf, London.

Oil, Citronella.—Is unaltered at 10*d.* per lb. in cases, and 9½*d* in drums.

Oil, Lemongrass.—Is coming to hand more freely, but the quotation is unaltered at 8*d.* per oz. To arrive, 7*d.* to 7¼*d.* c. i. f., is wanted.

Quinine.—As a consequence of the 7 per cent. decline in bark at the Amsterdam auction, makers of German quinine reduced their quotation by ½*d.* per oz. now 1*s.*, 2*d.* with the intimation that "until further notice the falling clause will be given for contracts." A larger reduction had been anticipated by outside holders, so this was considered satisfactory, and the week closed with sales of about 40,000 oz. at 1*s.* 0¾*d.* for December delivery, and 1*s.* 1¼*d.* for March. Early this week, however, prices slightly receded again, December selling at 1*s.* 0½*d.* and March at 1*s.* 1*d.* subsequently becoming rather firmer, with a small business at 1*s.* 0¾*d.* for December, and 1*s.* 1¼*d.* for March. To-day the market is quiet, and the above prices are unchanged. Whiffen's price has also been reduced to 1*s* 2*d.* for 1,000 oz lots. The result of to-day's quinine-sale at Batavia is as follows: Of 6,600 kilos. Ed. 11. offered, 5,200 kilos. sold at an average of 20 fil. per kilo. (about equal to 7¾c. Amsterdam) against 20½ fl. at the October sale. The next auction to be held at Batavia will take place on December 18. In response to a petition the Board of Trade have consented to publish the imports and exports of "quinine and quinine-salts" monthly in the Board of Trade returns commencing January next.

Spices.—There is a better tone in this market and more business is apparent, especially in pepper, at improving prices. The auctions on Wednesday were unimportant, the principal feature being a fair show of Jamaica Ginger, mostly second-hand parcels. The bidding was slack, and the holders with-

drew all the lots at firm prices. Washed rough Cochin sold at 51*s.* per cwt. for good quality, and a few cases of very bold-cut sold at 100*s.* per cwt. but the remainder was bought in, medium and small-cut at 75*s.* and bold rough Calicut at 58*s.* per cwt. Sales of Japan to arrive have been made up to 36*s.* 6*d.* per cwt. c. i. f. terms. Zanzibar Cloves declined last week to $3\frac{7}{8}$*d.* per lb. for January-March delivery, but have since recovered considerably, $4\frac{1}{8}$*d.* being paid on Wednesday. Ordinary Penang were bought in at $8\frac{1}{2}$*d.* per lb. Pimento firm, greyish sold at $3\frac{1}{4}$*d.*, ordinary stalky at $3\frac{3}{8}$*d.* and good clean at $3\frac{1}{2}$*d.* per lb. Mace quiet, small dark was bought in at 1*s.* 4*d.*, small red at 1*s.* 8*d.* and middling at 1*s.* 11*d.* per lb.

Turmeric.—Business has been done in Cochin split bulbs at 12*s.* 3*d.* per cwt. spot. For Bengal ginger 17*s.* 6*d.* spot is wanted, and for arrival there are sellers at 14*s.* 6*d.* c. i. f.

Black Pepper.—The market is dull and value is easier. For arrival 50 tons Singapore January-March shipment (S.) have been sold at $6\frac{1}{8}$*d.* and 25 tons October-December at 6*d.* On the spot small sales of fair Singapore have been made at 6*d.*

At public sale on Wednesday, 324 bags Singapore retired at 6*d.* to $6\frac{1}{8}$*d.*, 200 bags Penang at $5\frac{3}{4}$*d.* to $5\frac{7}{8}$*d.*, and 125 bags Aleppy at $6\frac{1}{8}$*d.*, also 259 bags shells at 3*d.* per lb.

White is firm, but only small sales reported. Sales of fair to good Singapore on spot at $9\frac{1}{4}$*d.* to $9\frac{3}{8}$*d.* and Penang at $8\frac{3}{4}$*d.* For arrival nothing reported.

At auction on the 6th instant of 247 bags Singapore 60 bags sold at $9\frac{3}{4}$*d.* for good. 94 bags Penang retired at $8\frac{7}{8}$*d* per lb.

Coffee.

We would call our readers' special attention to our market report on Coffee. It is not merely exceptionally interesting; it is indeed of a somewhat startling character, and brings the news to the very hour at which the last mail left London. The market was quiet and dull until the day before the mail left, when Messrs. Johnston & Co. cabled an estimate of the new Brazil crop 2,500,000 bags Rio, 4,500,000 bags Santos, and thus set things moving upwards. There appears to be little room for doubt that the next Brazillian crop will be a small one, but the present statistical position of coffee is weak that this small crop can do little more than save the situation. Of course, prices will probably rise, they are likely to rise much more than the actual shortage of crop warrants, for speculators are keen upon seizing the opportunity for a "bull" movement. Still, unless there be a succession of short crops, the reaction must come. Here are a few figures. Stocks on 1st November:—

	Europe. Tons.	United States. Tons.	Totals. Tons.
1897 -	- 150,060	44,117	194,767
1898 -	- 209,450	61,529	270,979
1899 -	- 230,350	70,058	300,408
1900 -	- 224,550	53,352	277,902
1901 -	- 242,200	107,882	350,082

Against this tremendous increase of stocks must be set a very satisfactory expansion of deliveries, which has been particularly remarkable in the United States. In the first ten months of 1887, American deliveries totalled 260,350 tons; in the corresponding period of 1901, 324,172 tons.

Joint European and American figures are as follows:—

	First 10 Months. Tons.
1897 - - - - - -	642,420
1898 - - - - - -	697,078
1899 - - - - - -	725,207
1900 - - - - - -	701,050
1901 - - - - - -	777,442

The following figures are given by Messrs. Duuring & Zoon as showing consumption during the first nine months of the year:—

Consumption in January to September.

	1897. Tons.	1898. Tons.	1899. Tons	1900. Tons.	1901. Tons.
In Germany	102,900	119,460	116,010	128,030	131,490
In France	56,480	59,480	58,650	60,800	60,400
In Austria Hungary	28,840	32,000	29,120	31,470	30,720
In United Kingdom	9,320	9,480	9,840	10,520	12,640
In Belgium	20,440	23,590	21,560	20,650	23,460
In Switzerland	6,920	8,300	6,720	6,660	6,270
	224,900	252,310	241,900	258,130	264,980
In U. States of N. Am.	230,760	262,000	271,820	233,290	274,470
	455,660	514,310	513,720	491,420	544,450

The London Commercial Record says:—Auctions have heen held on only one day this week, when Santos was the only growth offered, which went off without alteration in value, further public sales being postponed owing to heavy fog, and there is consequently no business of interest to report, prices remaining nominally unchanged. The market for Brazil "futures" opened with a slight decline, but latterly a much stronger tone has prevailed, owing to further reports of drought, yesterday registering a rise of 2*s*. 6*d*. to 2*s*, 9*d*. on the day, and closing at the best point, on balance 2*s*, to 2*s*. 3*d*. dearer on the week. Yesterday's sales include-December at 34*s*. 9*d*. to 36*s*. 6*d*. March at 35*s*. 9*d*. to 37*s*. 6*d*. May 36*s*. 3*d*. to 38*s*. 1½*d*. and September at 37*s*. 3*d*. to 39*s*. 3*d*. we quote:—

London -	Santos -	Dec. delivery -	35*s*. 9*d*.
New York -	No. 7 Rio -	,, -	6.80 cents.
Hamburg -	Santos -	,, -	35¾ pf.
Havre -	Santos -	,, -	43¾ *francs*.

Auctions to-day offered 6 casks 9 barrels 1 bag Ceylon, 1,378 bags East India, 52 bags Nyassaland, 39 bags Jamaica, 555 bags Costa Rica, 90 bags new Granada, 19 bags Vera Paz, 46 bags Mexican, 116 bags Salvador 154 bags Ecuador, 147 bags Colombian, 39

bags Caracas, 38 bags Java, 279 bags Guatemala, 347 bags Rio, and 500 Santos. The sales went off with good competition at full rates.

A cable to hand yesterday from Messrs. E. Johnston & Co. says "Prospects very bad indeed for the coming Rio as well as Santos crops. Estimate the former at 2,500,000 bags and latter at 4,500,000 bags."

Brazil futures have continued excited on strong improvement in the Continental markets on Messrs. E. Johnston's report, which we annex, and our market opened this morning at 1*s.* 3*d.* to 1*s.* 6*d.* advance, and we close at almost the highest of the day. May opened at 39*s.* and has been done up to 39*s.* 6*d.* March at 38*s.* 7½*d.* September 40*s.* 4½*d.* up to 40*s.* 7½*d.* December 37*s.* 6*d.* to 37*s.* 10½*d.*

Receipts are moderate, *viz.*:—73,000 bags and pointers are still less, *viz*: 40,000. Exchange remains unchanged at $11\frac{29}{32}$*d.*

In comparing Messrs. Johnston's estimate for the next crop with receipts already received from 1st July to present time, we would point out that so far this season we have received 8,250,000 bags which have nearly all gone into consumption, against their estimate of seven millions for both crops. If these figures are correct of course next year we must see prices many shillings dearer.

New York opens steady at 5 to 10 points advance.

Messrs. E. Johnston & Co. favour us with the following:—From Rio:—From information carefully gathered in all "districts, Rio flowering practically failure. In some districts owing to want of funds and low prices, labourers and Metayers abandoning land. From appearance at present new Rio crop estimated at about 2½ millions maximum. Owing to trees very bad condition, further flowering unlikely."

From Santos:—"Trees very exhausted from old Santos crop, and damage to crop serious owing to drought. It has rained a little recently, but not sufficient to be beneficial. Drought continues; unless there is continued rain very soon, new crop estimated at about 4½ millions."

At the Dutch Trading Co's public sale held in Amsterdam on Tuesday, 19,699 bags 97 cases were offered; good ordinary Java realised 38*c.* against 35½*c.* valuation, and 35*c.* last sales held in Rotterdam.

The following are some of the particulars:—

Lying in Rotterdam.

No.	Bags.	Valued at Cents.	Result Cents.
1	339	36	39¼ at 39½
2	970	36	39½ at 40
7	726	36	38 at 38¼
13	468	23½	23¾ at 24
14	1,248	38	40 at 40¼
15	556	33	36 at 36¼
16	444	33	35½ at 36
17	649	45	47¼ at 48
19	462	19	20½

The next auction will be held January 28th, 1902.

Imports, Deliveries and Stock of Coffee in London are as follows:—

	Stock.		Imports.	
	1901.	1900.	1901.	1900.
Tons	13,513	16,680	41,912	32,699

	Home Consumption.		Export.	
	1901.	1900.	1901.	1900.
Tons	16,984	13,879	25,957	16,732

The preceding figures exhibit - -	Tons.
In the Imports an increase this year of	9,213
Home Consumption an increase of	3,105
Export an increase of - - -	9,225
Stock a decrease of - - -	3,167

Auctions on Tuesday went off as under:—

Brazil.—1,125 bags washed Dumont Santos sold-small greenish to colory 32*s.* to 35*s.* 6*d.*, medium 37*s.* to 41*s.*, bold 42*s.* to 49*s.* 6*d.*, peaberry 35*s.* to 52*s.* 2,394 bags unwashed Dumont Santos, quay terms, sold-small greenish foxy to pale greenish 30*s.* 6*d.* to 32*s.* medium 32*s.* 6*d.* to 36*s.*, bold to extra bold 35*s.* 6*d.* to 44*s.*, peaberry 35*s.* 6*d.* to 41*s.*

Receipts in Rio and Santos.

	1901-2.	1900-1.	1899-00.	1898-99.
Since July 1	Bags.	Bags.	Bags.	Bags.
Rio - -	2,780,000	1,286,000	1,659,000	1,433,000
Santos -	5,444,000	4,202,000	3,746,000	3,017,000
Total ...	8,224,000	5,488,000	5,405,000	4,450,000
Crop		10,900,000	8,971,000	8,772,000

Rio Exchange $11\frac{29}{32}$*d.* previous day $11\frac{13}{16}$*d.*

Havre, November 7.—Good average Santos November opened steady at $43\frac{1}{2}$f. and closed steady at $43\frac{3}{4}$f., December opened at $43\frac{1}{2}$f. and closed at $43\frac{3}{4}$f., March opened at $44\frac{1}{2}$f. and closed at $44\frac{3}{4}$f. May opened at 45f. and closed at $45\frac{1}{4}$f., September opened at 49f. and closed at $46\frac{1}{4}$ f.

Hamburg, November 7.—Good average Santos November opened steady at $34\frac{1}{2}$ pf. and closed steady at $35\frac{1}{2}$ pf., December opened at $35\frac{1}{4}$ pf. and closed at $35\frac{3}{4}$ pf., March opened at $36\frac{1}{2}$ pf. and closed at 37 pf., May opened at $37\frac{1}{4}$ pf. and closed at $37\frac{1}{2}$ pf., September opened at $38\frac{1}{4}$ pf. and closed at $38\frac{1}{2}$ pf.

New York, November 7.—Closing prices of No. 7 Rio were as follows:—

	Nov.	*Dec.*	*Jan.*	*Feb.*	*Mar.*
November 7	- 6.75	6.80	6.90	7.00	7.10
November 6	- 6.10	6.20	6.30	6.40	6.50

"PLANTING OPINION" MADRAS.
30th November, 1901.

The Weather.

The weather Returns from the majority of stations shew that November was a comparatively wet month. Singapore and Penang, however, had an average rainfall, with 8·30. and 9·84 inches respectively. Malacca was over the average with a fall of 12.30. It is in Perak, and in Selangor to a slightly lesser extent that the most abundant showers fell, thus in Taiping a fall of 23.37 was registered, the lowest reading in that State being at Ipoh where 10.50. fell. In Selangor, Kuala Lumpur had the greatest fall 18.84. being registered. While Klang kept up its reputation for comparative dryness with 8.61. The returns from Pahang were about the average and fairly equable from all stations.

Singapore.

Abstract of Meteorological Readings for November, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·885	138·7	79·4	86·2	73·5	12·7	77·0	·869	75·3	82	N.E. & W.S.W.	8·30	2·13

K. K. Hospital Observatory,
Singapore, 13th December, 1901.

A. B. LEICESTER

Assistant Surgeon and Meteorological Observer.

Penang.

Abstract of Meteorological Readings for November, 1901.

District	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest rainfall during 24 hours.
			Mean dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Prison Observatory ...	29·873	146·6	79·9	89·7	73·1	16·6	74·9	770	70·1	69	South.	9·84	2·49

G. D. FREER,

Acting Colonial Surgeon, Penang.

Penang, 9th December, 1901.

Malacca.

Abstract of Meteorological Readings for November, 1901.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital.	29·838	151·7	82·1	87·7	67·5	20·2	80·8	1·033	57·3	93	N.	12·30	1·97

Malacca, 5th December, 1901.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for November, 1901.

District.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	153	80·04	90	71	19	76·54	·867	85	23·37	3·91
Kuala Kangsar ...	...	79·36	91	71	20	76·12	·858	86	14·54	2·49
Batu Gajah ...	159	79·92	92	72	20	76·59	·869	86	13·48	1·90
Gopeng ...	...	79·42	90	66	24	76·49	·873	87	11·50	1·86
Ipoh ...	...	79·54	91	71	20	76·26	·864	86	10·50	1·30
Kampar ...	...	...	89	69	20	...	...	...	18·34	4·31
Teluk Anson ...	...	80·15	90	72	18	76·91	·882	86	15·39	5·00
Tapah ...	..	79·79	90	70	20	76·29	·861	85	17·70	1·83
Parit Buntar ...	...	80·29	91	72	19	77·11	·893	87	11·40	2·00
Bagan Serai ...	...	80·12	89	72	17	77·08	·891	87	22·03	3·49
Selama ...	...	80·09	90	72	18	76·70	·874	86	19·35	2·62

Taiping, 9th December, 1901.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for November, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·852	145·1	79·4	90·1	71·8	18·3	76·2	0·840	74·0	84	Calm	18·88	4·82
Pudoh Gaol Hospital „	...	...	...	...	...	..	...	...	...	...	...	12·79	1·85
District Hospital „	...	...	...	...	...	...	...	...	...	...	...	14·33	2·80
„ Klang	...	...	...	85·2	74·4	10·8	...	...	...	...	...	8·61	1·57
„ Kuala Langat	...	...	...	86·2	73·2	13·0	...	...	...	...	...	870	3·20
„ Kajang	...	...	...	83·9	76·3	7·6	...	...	...	...	...	15·94	3·37
„ Kuala Selangor	...	...	...	84·8	74·1	10·7	...	...	...	...	...	10·83	1·96
„ Kuala Kubu	...	...	...	88·3	72·9	15·4	...	...	...	...	...	17·04	3,60
„ Serendah	...	...	...	86·2	74·1	12·1	...	...	...	...	...	16·75	3·42
„ Rawang	...	...	...	84·3	73·8	10·5	...	...	...	...	...	15·19	2·15
„ Jeram	...	...	...	...	...	...	...	...	...	...	...	12·75	4·48

State Surgeon's Office,
Kuala Lumpur, 10th December, 1901

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for November, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis - -	...	...	...	94·5	71·5	19.2	...	...	...	...	...	13·73	4·58
Raub - -	...	...	...	91·0	70·0	16.33	...	...	...	...	...	14·59	1·86
Bentong - -	...	...	...	90·0	68·0	22.0	...	...	...	...	...	16·94	3·72
Kuantan - -	...	...	...	85	76	9	...	...	...	...	...	9·72	1·39
Temerloh - -	...	...	...	90	71	19	...	...	...	...	...	8·63	1·60

RESIDENCY SURGEON'S OFFICE,
Kuala Lipis, 20th December, 1901.

P. N. GERRARD, M. D.,
Residency Surgeon, Pahang.

No. 5.] FEBRUARY, 1902. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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ERRATA.

Page 144 of Agricultural Bulletin No. 4, January, 1902 :—

For *Pygeum* read *Parinarium*.

NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commerical value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN
OF THE
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FEDERATED MALAY STATES.

No. 5.] FEBRUARY, 1902. [VOL. 1.

THE TIMBERS OF THE MALAY PENINSULA.

Continued.

RHIZOPHOREÆ.

This order includes most of the plants known as *Mangroves*, though not all the trees which compose a mangrove forest belong to this order for besides these, the Nireh (*Carapa* order *Meliaceæ*), Dungun (*Heritiera* order *Sterculiaceæ*), *Avicennia* order *Verbenaceæ*, and several others are commonly to be found with the true mangroves, known here as Bakau. These plants are easily distinguished by their peculiar fruit which germinates on the tree producing the long cigar-shaped green root so well known. The trees inhabit tidal rivers as far up as the sea water goes, and emitting roots from the branches form the impenetrable thickets along the edge of the sea and rivers. These thickets often have a great value in holding the banks of the rivers, and preventing their being gradually washed away, and cases have occurred where the destruction of the mangroves have so altered the mouth of a river that the mud banks on either side having been washed down, boats over a certain draught are no longer able to go up or down.

The mangrove is the most important supply of firewood being used for nearly all the smaller steamers, engine works, and household firing, being preferred to any other wood for these purposes. The bigger trees are used also for piles and posts in wet places, as they long resist the action of water. The bark of several species is used for tanning and dyeing nets, cloth and skins, and there are manufactories of Mangrove Cutch for export in Borneo and elsewhere. The Mangrove Cutch chiefly derived from Ceriops Candolleana, Tengah, is mainly used in Europe for dyeing.

In some parts of the Peninsula the mangroves have been so largely cut for firewood that they are quite destroyed. The native wood cutter cuts where he can get the wood away in the easiest manner, that is to say on the edge, thus driving back the mangrove. In some spots where from propinquity of the town the demand for firewood is large, the swamps formerly containing true mangroves, now consist of nothing but the worthless Avicennia

which is not used for firewood. The Rhizophoreæ grow fairly fast and there is no difficulty in leasing the swamps to wood-cutters so that they may not entirely destroy the useful wood and leave the swamps useless forever. By leasing in blocks for definite periods, closing them for one or two or even more years after each period, a mangrove swamp should give a definite annual return forever.

Rhizophora conjugata, L. Akit.

A fairly large tree with large dark green leaves and yellow flowers.

Wood heavy reddish brown with fairly distinct rings numerous medium sized pores, and conspicuous rays. Rather a well-figured wood, good for piles and such like work. It can be obtained of large size as much as 30 feet by 11 inches through, and is very durable.

This is the timber experimented on by Newton under the name of "Bucco". Weight 70 lbs. (Gamble), S. 63 lbs. 8 ozs. to 65 lbs. 8 ozs.

R. mucronata, Sam. B'lukup.

Is very similar but rather lighter in colour.

Bruguiera gymnorhiza, Lam. Tumu.

Is also one of the bigger mangroves and attains as large a size as does Akit. The wood is fairly heavy light reddish brown close grained, with less numerous pores, very obscure rings, and irregular rays. A very hard wood. Weight 54 lbs. 13 ozs. to 56 lbs. 4 ozs. Used for posts, planks and furniture in India. It is good for piles and posts in wet places.

B. caryophylloides, Bl. Bosung.

Is a smaller tree, with fairly heavy wood of a light reddish fawn colour, with very obscure rings, numerous pores and very close rays. It is a very fairly good wood but as a rule is too small for piles. Weight 48 lbs. 11 ozs., 50 lbs. 7 ozs., 76 lbs.

B. parviflora, W. & A. Lenggadi.

Is very similar as regards the wood, but lighter in colour with more conspicuous rays. It is also a smaller tree. Weight 49 lbs. to 49 lbs. 6 ozs.

Ceriops Candolleana, Arn. Tengah.

A medium sized tree with compact close grained fairly heavy light reddish brown wood, with moderately numerous small pores and close rays. Weight 63 lbs.

Used for firewood, knees of boats, posts, etc. Bark for tanning and dyeing.

Legnotidæ.

A small group of trees usually classed under *Rhizophoreæ*.

Pellacalyx saccardianus, Scort. Kayu Johor.

A small tree about 30 or 40 feet tall straight and little branched, common in open country.

The wood is fairly heavy yellowish brown with a very curious structure, the rays are very broad and connected with cross bars. Weight 32 lbs. It resembles that of some of the Anonaceæ.

It is used for rafters and house work.

P. axillaris, Korth.

A common tree of no great size with soft light whitish wood, with broad rays and very numerous close pores. Weight 26 lbs.

Gynotroches axillaris, Bl. Mata Keli.

A small tree very common in secondary woods with stiff deep green leaves and small white flowers and red and black drupes in clusters. The wood has broad conspicuous rays and very fine transverse bars, and the pores are very numerous and close. The colour is light brownish and it is rather soft.

Used for house-work, rafters, etc. according to Maingay, also for blades of oars. It is considered good for house posts by Malays. Weight 41 lbs. 11½ ozs. (Maingay), S. 40 lbs. 5 ozs.

Combretaceæ.

Contains only two genera of importance, *viz. Terminalia* and *Lumnitzera.*

There are about six species of *Terminalia* in the Peninsula but some are by no means common, among which are *T. belerica*, Roxb. a tree with soft wood producing one of the myrobalans exported from India for dyeing and *T. citrina*, Flem. with a hard grey wood used for planking in Assam, which has been met with in Malacca and elsewhere. *T. Catappa*, L. Katapang is a common sea-shore tree often planted along road sides. The wood is fairly hard red or yellow with a good deal of white sapwood, rings fairly distinct and large, pores large, rays fine. It is sometimes used for house and boat building, and is considered good. Weight 26 lbs. 6 ozs.

Lumnitzera coccinea, W. & A.

A tall straight tree attaining a height of about 40 feet and a diameter of 1½ feet with rough bark, small oblanceolate leaves and bunches of scarlet flowers. The wood is yellowish brown fine grained glassy with fairly distinct irregular rings, small pores in rows parallel to the fine broken up rays. Weight 59 lbs. 7 ozs.

The tree is common in mangrove swamps, all over the Peninsula and its wood is used for axles of carts and such like work.

Myrtaceæ.

This is a very extensive order consisting almost entirely of trees or large shrubs. It contains here several genera all agreeing in having white or pink flowers with innumerable stamens, small petals and an inferior ovary, and nearly all can be distinguished in leaf, by their possessing a nerve running along each side of the leaf close to the margin. None of them attain to the vast size of many of our forest trees but many are big enough to supply large beams, the timber of which is often very good.

The important genera here are *Melaleuca, Rhodamnia, Tristania* and *Eugenia.*

Melaleuca leucadendron, L. Gelam.

A common tree in swampy spots in Malacca and elsewhere, is our only species of this genus, which is typically Australian. It is a fairly large straight tree, attaining a height of 40 feet and a diameter of 2 feet. The bark is very thick and whitish peeling off in large flakes. It is used for caulking boats, and making torches etc. An attempt has been made in Australia to utilize it as a paper-stuff but without sufficient success. The leaves are narrow lanceolate dull green and small, with a strong smell of Kayu putih (Cajeput) oil which indeed is extracted from them, in the Moluccas. One or two attempts have been made to prepare oil from the leaves here, but from some unexplained reason the oil did not suit the home market, partly perhaps on account of its dull colour, but as the tree seems to be alsolutely identical with that of Buru, where the oil is usually manufactured there seems no reason why the oil should not be manufactured here. It is prepared by distilling the leaves.

The tree is of fairly rapid growth and will grow even in water; edges of ricefields suit it and it is planted as a shade tree along the roads across the ricefields in Malacca where it has not only the advantage of being a good shade tree by day, but also from its white bark can easily be seen in the night. It is very suitable too for planting as a firewood supply, as it gives plenty of wood for burning very soon after planting. The wood is hard and moderately heavy dark brown, close grained pores small in short rows parallel to the rays, and connected by short concentric wavy bars of light tissue, rings fairly distinct, rays very fine and numerous. Used in building, piles etc.

Weight 46 lbs. 12¾ ozs. (Maingay), S. 64 lbs. 11 ozs.

It is used for piles etc. Weight 46 lbs. 12¾ ozs. a cubic foot (Maingay.)

Rhodamnia trinervia, Bl. Mempayan.

Is a very common tree in secondary jungle. It attains seldom any great size usually about 20 to 30 feet with a diameter of stem of a foot. It has ovate 3 nerved leaves usually silvery on the back, small white flowers often produced in great abundance and red berries turning black when ripe. The timber is very hard and durable, troublesome indeed to cut, heavy and of a dark brown colour with little or no sapwood. The pores are few and the rays very fine. The bark is thin brown and flaky, could large sized timber of this tree be procured it would be very valuable, but it is difficult to get even a moderate sized beam from it. It grows readily in very poor soil and can stand grass fires pretty well. Weight 44 lbs. 9 ozs; 63 lbs. 10 ozs. (Maingay), S. 56 lbs. to 59 lbs. Wood used in Sumatra for building, and ploughs (Veth).

Baéckia frutescens, L. Daun Chuchor Atap.

A small or medium-sized tree with rough flaky bark, aromatic needle-like leaves, (used in native medicine for fever) and small white flowers. Attains a height of 20 or 30 feet and a diameter of 4 or 5 inches. It only occurs at an altitude of 3,000 feet and

upwards. Wood exceedingly hard and compact, heavy, close grained dark red, rays very fine, pores very small and not very numerous arranged in clusters and short lines. Very durable, a useful tree for hill regions. Weight 76 lbs. 14 ozs.

Psidium guava, L. Guava.

This well known fruit tree, has pale brown close-grained wood with very small pores connected more or less by transverse bars of softer tissue, and arranged also in rows often partitioned, numerous, and rather broad rays. Weight 44 lbs. (Wallich), 42 lbs. (Gamble), 47 lbs. (Skinner).

Though small used for wood engraving, spear handles and other purposes in India and Java.

Decaspermum paniculatum, Kurz. Kelintek Nyamok.

A small common tree, with large bunches of white flowers. Wood dull dirty white, grain fine hard splits deeply in drying. Weight 49 lbs. 13½ ozs., 53 lbs. 1 oz. (Maingay).

Used for building in Java.

Tristania. Pulawan.

There are two or three species of this genus here, usually occurring on the hills. They are readily recognized by their peculiar red bark which peels off in long thin flakes forming a large pile at the foot of the tree. The stem of the tree appearing meanwhile perfectly smooth. The only other tree which does this here is *Cratoxylon polyanthum.*

The leaves are narrow and the flowers are usually white or green in large corymbs, and often having a most unpleasant odour.

T. Whitiana, Griff.

Is an inhabitant of sandy spots near the sea, very common round the coasts of Singapore, etc. The wood is dark brown hard and heavy with very fine rays and rather large but few pores. Although the tree is not large, it gives very good straight beams and posts of fair size and is very durable. Weight 57 lbs. 8 ozs.

T. merguensis, Griff.

Is a very similar tree with broader leaves, which have a gray appearance in mass. It is very abundant in the hill districts in many places at about 2,000 feet altitude and upwards to about 4,000 feet. The wood is darker and redder in colour than that of *T. Whitiana* and the fibres are more waved, as a rule. It is one of the few good timbers to be met with at any elevation and is useful for building houses, etc. in hill stations. Weight 71 lbs. 14 ozs.

Eugenia, is a very strongly represented genus here as indeed it is in almost all tropical countries. The flowers vary in size, from two inches across in the section Jambosa, to ¼ or less in the section Sizygium. They have usually small and fugacious petals, and long and very numerous stamens white, pink or rarely green. The fruit is sometimes as large as a pear, or it may be as small as a pea. It is often eatable, and two or three species. *E. malaccensis, E. jam-*

bosa, E. aquea, are cultivated and commonly known as Rose-apples (Jambu).

The timbers are usually good, and some are exceptionally so, and can be used for house or ship building. As a rule the species with small leaves and flowers (the section *syzigium*, the Kayu Kelat of the Malays) have harder and better wood than the large flowered Jambosas (Jambu).

E. grandis, Wight. Jambu Ayer Laut, Krian.

A very fine large tree attaining a height of 60 feet and a diameter of 2 feet, with light coloured whitish bark hard ovate dark green leaves polished in the upper surface, large white flowers in big corymbs and single seeded green fruit about an inch long. This tree is usually to be met with near the sea in a wild state but it has been much used as a road side tree in Singapore and is now widely scattered over the island. It is to be met with all over the Peninsula as far north as Lankawi. It will grow in very poor soil, but very damp spots do not suit it, as it is very liable to the attacks of a fungus which causes the bark to crack and split off and beginning usually at the foot of the tree gradually creeps up, till the tree is destroyed. The tree grows fast from seed and will resist fire very well. It is well suited for making fire guards in country liable to grass fires, as it will not burn, and soon recovers any damage from fire. A belt of about twenty feet closely planted will stop almost any grass and scrub fire.

The wood is light brown in colour fairly heavy and not very hard, with moderate sized pores in short concentric light coloured bands and distinct rings marked by dark hard wood with few or no pores.

It is used in boat building, and for house beams etc. and is very fairly durable. Weight 51-52 lbs. (Gamble), 35 lbs. 2 ozs. to 53 lbs. 10 ozs. Average 42 lbs.

E. lepidocarpa, Wall. Samak.

Is a rather smaller tree with thicker, shorter and broader very dark green polished leaves, smaller white flowers, with the ovary ribbed. It is also a sea shore tree, and is very common in the South of the Peninsula at least.

The bark is used for tanning, The wood is fairly heavy and hard, close grained and deep brown, with numerous fairly small pores, very fine rays, and obscure rings. A good useful wood but not as a rule very large. Weight 48 lbs.

E. inophylla, Roxb.

A closely allied plant, much less common, has very similar wood but less coarse in texture. Weight 56 lbs. 7 ozs.

E. malaccensis, L. Jambu Bol.

A very handsome tree with large crimson flowers borne on the branches in tufts, and large white or pink fruit commonly cultivated for eating, has brown wood with moderately large pores.

It is harder than that of the Krian (*E. grandis*) but the tree is shorter and does not supply large enough beams to be of much

use. It appears to be seldom used. Weight 30 lbs. (Wallich), 38 lbs. (Gamble), S. 32 lbs. 10 ozs.

E. macrocarpa, Roxb. Kelat Burong, Kelat Jambu.

Is a large tree attaining a height of fifty feet, the timber is brown and heavy. Beams will last five or six years if exposed.

E. filiformis, Wall. Kelat Bilian, Kelat Lapis.

Is a common tree attaining the height of from fifty to sixty feet, and will give beams squaring to 5 or 6 inches or even more. The timber is heavy, of rather a light brown colour with numerous pores. It is decidedly a high class Kelat wood. Weight 48 lbs. 1 oz.

E. aquea, Burm. Jambu Ayer Mawer.

A common fruit tree attaining no great size, has a fairly hard wood, but not large enough for building.

E. Thumra, Roxb.

A big tree with tall straight stem, flowers apple green. Wood fairly heavy and hard light brown, rings distinctly marked, pores medium sized in wavy lines of a light texture, very numerous, rays fine, showing as reddish bars on a darker ground in longitudinal section. A good useful wood, something like that of E. grandis. Weight 38 lbs. 13 ozs.

E. zeylanica, Wight. Kelat Nasi-nasi.

Usually occurs as a shrub near the sea, but sometimes grows inland, and at times attains a large size. It is recognized by its narrow small leaves, red bark, and white aromatic drupes. The wood is dark brown, heavy and compact, and would be very good if it could be procured of sufficiently large size. It is, however, chiefly used for firewood. Maingay states it is used in ship building and gives the weight at 60 lbs. $9\frac{2}{3}$ ozs. per cubic foot, Singapore specimen 54 lbs.

E. caryophyllata, Willd.

A fair sized tree with rounded deep green leaves forming a dense head. The timber attains a fair size though the tree is not so large as many others. It grows readily in almost any soil. The wood is light yellowish in colour, and structurally resembles that of *E. lepidocarpa*. Weight 43 lbs. 14 ozs. to 50 lbs. 12 ozs.

E. lineata, Bl. Kelat Merah.

A common tree in the South, growing readily in secondary jungle, attaining a height of about sixty feet and a diameter of $1\frac{1}{2}$ feet. In open dry places it has a tendency to branch low down instead of making a tall stem. It is also liable in open spots to a disease resembling what is known as "Witches' broom" in England. The wood is very hard and tough rather coarse in texture with large pores and conspicuous rings rather waved. The pores are arranged in rows parallel to the rings. A very good wood for general purposes, but it has a tendency to split. Weight 47 lbs. 13 ozs. to 52 lbs. 8 ozs.

The timber described hy Howard Newton as Kelat may be from this species but the pores are more definitely arranged in rows than in this or any other species I know of. He says of it that it is not very highly esteemed, but still is possessed of fair average transverse strength. It is close grained, durable and not more difficult to work than Daru.

Among other good species may be mentioned, *E. acuminatissima,* Kurz. Kelat asam, attaining a height of 40 feet, *E. subdecussata,* Wall. 60 feet, giving beams 5 or 6 inches square, of dark red heavy timber, *E. conglomerata,* Duthie. Selembat, from 30 to 60 feet tall, a very fine tree. *E. nitida* Duthie. a good hard wood rather light in colour with few pores. Weight 49 lbs. 3 ozs.

E. sp. with rather thin large leaves and white flowers in tufts on the old wood of the branches, with rather light coloured brown wood, close grained and heavy. *E. pustulata,* Duthie. Gelam Tikus, a tree with red flaky bark and very large stiff opposite sessile leaves, growing in wet spots in jungle.

Barringtonia, Putat.

Small to medium sized trees, usually growing near tidal rivers. The timber is usually soft and pithy, white or brownish with large and numerous pores and irregular rays. Very useless woods. VAN EDEN, however, says that *B. racemosa,* Bl. and *B. speciosa,* have hard durable wood used for house posts.

Barringtonia sp. Johore Putat. Weight 21 lbs. 15 ozs.
,, ,, Putat Manaun ,, 20 lbs. 3 ozs.

Melastomaceæ.

Comparatively few of this order are trees of sufficient size to produce timber of any value, being most shrubs or herbaceous plants.

Melastoma malabathricum L, the Senduduk and
M. decemfidum, Jack.

are shrubs with very irregular wood, the fibres being wavy, and broken up. The pores are rather large and scanty, the rays fine. The wood is yellow or red rather irregularly coloured, but it is too small and difficult to cut to be of any use even for cabinet work.

Pternandra echinata, Jack. Medang malukut,

Is a common tree with pale blue flowers. It attains no great size, usually about 30 feet tall and one foot through. The wood is close grained rather heavy and of a reddish brown colour, the pores are small and the rays very fine. Weight 41 lbs. 11¾ ozs. (Maingay), S. 33 lbs. to 57 lbs. 12 ozs.

Pt. coerulescens, Jack.

Is a small irregular tree with veined *ovate* leaves and small blue flowers. The wood is rather light, of a pale brown colour with irregular obscure rings, rather large pores and fine rays. Weight 18 lbs. 6 ozs. to 19 lbs. 2 ozs.

Memecylon.

To this genus belong the most useful woods in the order, for although they are all small trees, yet the wood is hard and springy, and many species are useful for house work, rafters and posts, and also for shafts for carriages and work where strength and flexibility are required. The trees are generally known as Mangas, or Bangas, by the Malays, and the large leaved species as *M. heteropleurum*, as Nipis Kulit. Some as *M. myrsinoides*, attain a height of from 30 to 40 feet, and the timber will last for five or six years if exposed.

M. acuminatum, Bl.

Has brown wood rather pale in colour fairly heavy, the rays are very fine, and the pores are small and arranged in clusters. The rings in this as in most species are obscure. Weight 61 lbs. 8 ozs.

M. cœruleum, Jack. Pantat ulat.

Has redder wood, with broad distinct rings, rather large and numerous pores which are rather large.

Other useful species, are *M. heteropleurum*, Bl. Nipis Kulit, *M. myrsinoides*, Bl., *M. loevigatum*, Bl.

M. miscrostomum.

A small tree with thin smooth bark, has dark brown wood, hard and heavy all through, compact and fine grained, rings conspicuous, rays very fine and obscure, pores very numerous and small. It would be a first-class timber were it only big enough for beams.

Lythrarieæ.

Lagerstrœmia, Bongoh.

There are three species here of this noble genus of trees well enough known from their magnificent pink or mauve flowers. The commonest species is

L. floribunda, Jack.

A large tree often cultivated and wild in Pahang and elsewhere chiefly along river banks.

The wood is light fawn coloured with the rings usually very distinct and large, sometimes rather close, rays fine and close rather obscure, pores of medium size in lines along the rings, the rings being marked out by lines of large pores. Weight 34 lbs. 12 ozs. to 37 lbs. 2 ozs.

L. Flos-Reginæ, Retz.

A very similar tree with larger flowers, is often cultivated and may be wild. The wood is very similar, and is used for building houses, and boats and rice mortars in Sumatra (Veth). Weight 31 lbs. 10 ozs.

L. hexaptera, Miq. Bungah Malukut.

A less common species has very similar wood but it is rather looser in texture.

The Bongohs are slow growing trees, but all attain eventually

a considerable size. In Burmah the timber of *L. Flos Reginæ* is considered the most valuable wood next to teak. It is used for ship building, boats, carts and general construction. Where obtainable here it is considered excellent for boats. The trees can be grown from seed or large cuttings in the same manner as the Angsana, *Pterocarpus*.

Duabanga sonneratioides, Ham.

A lofty tree with large spreading branches.

It is rare in the Peninsula, abundant, however, in Perak. In India where it is abundant (Assam and Burma) it is stated to be of very rapid growth, and to give a useful timber which does not split or warp and is used for tea boxes, canoes, etc.

Weight average 32 lbs. (Gamble).

Cryptorania paniculata, Bl. "Rupal".

A tree 60 to 70 feet tall, with hard and durable wood, said to be nearly as good as Merbau (*afzelia*) for building.

C. Griffithii, Clarke, "Bekwoi" Sumput chingga Badak.

About 40 feet tall, to nearly 100 feet, with long hanging spikes of green flowers. Diameter 1-2 feet. Wood brown, very close grained, rings obscure, pores numerous arranged in rows, wider than the rays. Weight 43 lbs. 9 ozs. A durable wood used in house building. Occurs in Penang and Malacca.

SAMYDACEÆ

Osmelia Maingayi, King. Bangas Merah.

A tree about 30 feet tall, wood reddish heavy. Used for posts and house building, durable.

Homalium frutescens, King. Petaling Ayer.

A medium sized to fairly large tree common along river banks. Wood fairly hard and heavy, light fawn colour, rays fine and close, pores small and numerous, rings distinct. A compact fine grained wood, valued for building. Johor, Selangor, Perak.

H. propinqum, C. B. Clarke. Pantat Ulat putih.

A big tree 70 to 100 feet tall, wood hard and strong black, beams 8 to 10 inches square may be obtained. Used in building. Malacca, Perak, Penang.

Araliaceæ.

Mostly soft wooded shrubs and small trees of little value.

Arthrophyllum diversifolium Bl. Jolok Hantu.

A very common small tree in secondary jungle. The wood is soft and light, white with large pores, it is quite useless even as firewood. Weight (S) 28 lbs. 12 ozs.

Aralidium pinnatifidum, Miq. Alus Surat

A small tree with entire or lobed leaves, common.

"Wood faint dull red hard, splits deeply in drying. Used for the upright supports of bridges and heavy work of a similar description. Weight 54 lbs. 10½ ozs. (Maingay).

CORNACEÆ.

Marlea ebenacea, C. B. Clarke. Lidah Kerbau Putih.

A big tree 60 to 100 feet tall.

Wood hard and durable, yellow with a red heart and strong. Used in building, giving beams 5 or 6 inches square. Maingay gives the weight as 44 lbs. 9¾ ozs.

M. nobilis, C. B. Clarke. Sutubal.

A big tree 70 to 80 feet tall. Wood hard and durable, used in building, giving beams 6 to 10 inches square.

NOTES ON ANNUAL RINGS IN TIMBER.

BY A. M. BURN-MURDOCK.

Apropos of remarks in the editorial in the Agricultural Bulletin No. 1 page 4, on timber rings, I think it might be of interest if I give a brief outline of a classification of timbers proposed by Prof. Marshall Ward, M. A., F. R. S., F. L. S., formerly professor of botany at Cooper's Hill college. His aim is to classify timbers so that by examination of the timber alone it may be identified. To do this would require an expert in all but the commoner timbers but if his method will at any rate teach us how to spot the common trees with certainty, and give the outlines of a practical system of classification, it will be a step in the right direction. Tree Ferns, and Cycads are of course omitted and only Conifers and Dicotyledons dealt with. Before coming to the actual system of classification the following phenomena should be observed.

1. The pith, though not belonging to the wood, sometimes presents marked features, *e. g.*, in Oak, the transverse section of the pith is pentagonal or rayed, and chambered in Walnut.

2. Comparison of heartwood with sapwood, here colour is often very marked, *e.g.*, in Ebony where the heartwood is black; Guaicum green; Cesalpinia sappan, red; Log wood, purple; and many others.

3. Again some trees have peculiar discoloured patches or spots known as medullary spots or pith flecks, looking like small patches of rust in the wood such as are seen in Birches and Hawthorns.

4. Many conifers are distinguished by their resin canals, and some Anarcadiaceæ, but these resin canals have nothing to do with true vessels of the wood, which will be mentioned further on.

5. We must now consider Medullary rays. These are radial stripes or rays, composed of cells elongated in a radial direction. In a radial section these would appear as bands of small height, in a tangential section, as elliptical group of cells. *All* Conifers and Dicotyledons which form timber are provided with these rays, which help greatly in the classification of timbers. Thus they may be few and far apart as in Laburnum, Robinia, or numerous and crowded as in Oaks, Rhodendron, maximum. Very narrow requir-

ing lens for their observation, as in Pines, Ebony, Horse chestnut, Willows, etc....or broad as in Oaks, and Casurina. The breadth of these rays varies from ·005 to I. m. m. and we may speak of fine, medium, broad, in classification. In Oaks there are two kinds of rays, large, broad, obvious, with more numerous and finer ones between. In the Beech the broad medullary rays widen out where they cross the boundary between the annual rings, and in some cases so called broad rays are really composed of several, running close together.

6. Next we come to annual rings. It may be questioned whether zones indicating periodic changes in growth are ever entirely absent from timber, but it is certain that in some tropical evergreen trees no such rings can be detected by the unaided eye, or even with a lens. Such timbers are said to be devoid of annual rings, or so called annual rings, as it is not certain that the periodic zones in all cases correspond to the annual increment.

The following show no annual rings...Iron woods as Mesua ferrea (Matopus, Penaga puteh), Xylia, Mango, Ebony, and doubtless many of the timbers of the Malay States, but the vast majority shew more or less concentric zones or rings, in many cases obviously annual ones, as in Teak, Cedrela toona, Oaks, etc. In other cases, as Ficus elastica (Rambong) Casurina, (Poko Ru) and Pongamia the apparent rings are found to be of a different character, and due to concentric or excentric zones of soft tissue called "false" rings. A little practice will enable the student to recognise them in most cases, for instance in Calophyllum (Penaga Puteh), Bintangor bukit, B. batu, etc., and many Sapotaceæ, Anonaceæ, and others, these partial zones are made up of wavy, pale bar like markings, between the medullary rays. As to timbers with undoubted annual rings two chief types must be distinguished.

(1.) The vessels in the spring wood are so large or numerous as contrasted with the vessels in the autumn wood of the same annual ring, that the boundary between the two is particularly sharp, as in Oaks, Teak, Ash, etc.

(2.) In the second type the ring is due to similar differences between the fibrous and other elements of the wood rather than to contrast of porous and dense wood, *e.g.,* the autumn wood has very thick walls and small lumina, while the spring wood has thinner walls and larger lumina, as for instance Shorea robusta (the Sal of India), Birch, Maple, Horse chestnut.

The next character of importance is the presence or absence of vessels, often called pores. (Care must be taken not to mistake Resin canals for pores). Vessels are found in the wood of all Dicotyledons with one exception, while they are as regularly absent from that of the Conifers, consequently these two great groups can be separated at a glance, at least with the aid of a lens. In dicotyledons, however, great differences occur in the vessels. Firstly, as to size, the rule is that vessels are largest and most numerous in the spring wood, diminishing outwards, but in one or two cases this is the reverse. Secondly, as to the arrangement of the vessels, and other characteristics, such as hardness, weight, grain, colour,

odour, etc. *e.g.*, Sandal wood, Teak, Deal, all of which have very distinctive odours. Again there are certain markings such as the satin like lustre of satin wood, the white mineral substances in the vessels of Teak, (apatite), etc. all of which give clues. As regards the bark, colour, thickness, texture, mode of stripping, should be observed.

The following table is that given by Proffessor Marshall Ward, as a possible method of classification of timbers. I believe that it may prove of great help to those who have to do with timber, although I am unable so far to put in more than a very few Malayan timbers owing to my want of experience in those timbers.

I.—Coniferæ.

Wood except close to pith contains no true vessels, but resin canals sometimes occur in the autumn wood. Annual rings sharply marked by denser autumn zone. Medullary rays very fine and numerous.

A. No resin canals present.
  (i). No true heartwood can be distinguished. (Silver fir.)
  (ii). Distinct heartwood. (All Pines and the Larch.)
B. Resin canals present.
  (iii). No true heartwood. *e.g.*, Spruce.
  (iv). Heart wood distinct. (All Pines and the Larch.)

II.—Dicotyledons.

A. Always have true vessels, wood complex in structure. Annual rings may or may not be present. Medullary rays always present.

B. No distinguishable annual rings, but sometimes zones (partial) of tissue forming incomplete bands which run into each other, not passing right round.

I. Partial rings or false rings present.
  (i). Medullary rays of two kinds, broad and fine.
a. The latter in majority, Indian Oaks, Quercus lamellosa, Q. incana.
  (ii). All medullary rays of one kind, and narrow.
a. *e.g.*, Figs, which have the false rings very distinct, Pongamia glabra, Terminalia belerica, no distinct heartwood.
b. False rings obscure, wood hard, heavy, and close grained, Iron wood type. Messua ferrea (Penaga puteh.
Heritiera littoralis (Dungun)
Hardwickia binata
Terminalia tomentosa
Dyospyros Melanoxylon
Xylia dolabriformis (these are the chief hard woods of India) all these have a dense red, brown, purple, or black heartwood, The following are difficult to classify.
Dalbergia Sissoo
D. latifolia
Bassia latifolia

Melia Indica,
Acacia Catechu, (Cutch of Burma)
A. Arabica,
Lagerstroemia parviflora,
Pterocarpus marsupium,

II.—No such partial zones or false rings are evident, no annual rings of any sort.

(*a*). Wood all soft, no heartwood. Bombax, Mango.

(*b*). Heartwood usually present, and wood denser.

Albizzia Lebbek,
Schima Wallichii,
Tamarix articulata,
Adina cordifolia,
Dipterocarpus tuberculatus etc.

B.—DICOTYLEDONS.

In which the annual rings are always distinguishable, and usually obvious.

I. Annual rings very clear owing to size or number of pores in spring wood.

a. Annual ring due to difference in size of pores, Oaks, with broad medullary rays, medullary rays all fine.

Ash, Elm, Chestnut,
Teak,
Cedrela Toona,
Melia Azedarach,
Lagerstroemia Reginæ,

b. Annual rings due to crowding of pores in spring wood : Plum, Elder, Lilac, Buckthorn,

Santalum album,
Gmelina arborea,

II. Annual rings distinct owing to denser autumn wood, and not to differences in size of pores.

a. Vessels small but visible without a lens, and scattered ***e.g.***, Walnut, Shorea robusta, (the Sal of India).

b. Vessels minute, and usually numerous. Wood hard, Beech, Birch, Box, Maple, Plane.

Eugenia Jambolana (Jambu),
Chloroxylon Swietenia (Satin wood),
Anogeissus latifolia,
Schleichera trijuga,
Aegle marmelos (Bale fruit tree).

c. Wood soft. Horse chestnut, Willow, Poplar, Alder,
Michelia excelsa (champaca),
Dillenia indica,
Boswellia thurifera,

GUTTA RAMBONG (FICUS ELASTICA) IN MALACCA.

On the 22nd of December last I was privileged in company with Messrs. PEARS and HUDSON and our host Mr. TAN CHAY YAN to take part in an experiment of tapping some Rambong trees, belonging to Mr. TAN CHAY YAN.

The Rubber trees in question are situated on the Bukit Lintang Estate some four miles from the town of Malacca; where Mr. TAN CHAY YAN has planted up an area of some 60 acres, originally with coffee, but latterly with Rubber. There are now on this Experimental Estate some 2,000 Rambong and 4,000 Para Rubber trees, the oldest of which are five and a-half years old. The Estate lies on a low hill, the soil for the most part being of a gravelly nature, except at the bottom which is of a rich mould, and where the finest trees both of Para and Rambong were found. I was informed that the majority of the Rambongs were raised from seeds obtained from Sumatra; a few, however, were raised from cuttings, and I must confess I could see little or no difference between the two. There are certainly two varieties there however, one having much larger leaves than the other, and a more drooping habit. The one having smaller leaves, I was told by the Chinese Mandore, gave the best supply of latex. How these varietal differences originated it is difficult to say, that is supposing they are not distinct species, which can only be accurately determined when they fruit. One of the objects of our visit was to try a Centrifugal machine belonging to Mr. PEARS. It is called the "Beta" Rubber Machine, and was obtained from T. CHRISTY & CO., 25, Lime Street, London. The machine consists of a tin cylinder 2′ 4″ tall, the bottom part 16″ high and 10″ in diameter being the broadest, the top part is narrowed into a neck 6″ in diameter. On the extreme top is fixed the handle connected with two cog wheels, working at right angles, which actuate a thin shaft 5″ long to which four blades are attached. At the bottom of the neck of the cylinder is a brass wire sieve of extremely fine mesh, dividing it from the broad part of the cylinder below. The capacity of the upper part or neck is about three or four pints, and into which the latex is poured. The *modus operandi*—according to the printed instructions accompanying the machine, is first to mix the latex with 50% of water, "then pour the latex into the upper part of the machine or washer, turning the handle quickly. Have an assistant to pour in water continuously, so as to wash the latex through the wire gauze sieve which is fixed in the base, until the lower vessel is full." At the bottom of the machine is a tap for drawing off the water and leaving the rubber on the surface; the rubber is removed by pouring it into sieves in a semi-liquid state out of a wide mouthed aperture situated at the top of the broad part of the cylinder for that purpose.

We started the experiment with mixing one and a-half imperial pints of pure Rambong latex with an equal quantity of water and poured it into the machine, and following the instructions as just

mentioned. In less than two minutes the whole of the diluted latex had run through the wire sieve into the bottom vessel, and so far as the object for which the machine was intended (*i.e.*) the separation of the globules of Caoutchouc that are held in suspension in the latex was apparently a failure. Why it was a failure I am not quite sure. What appeared to us to be reasons were that either the blades did not revolve with sufficient rapidity, or that the meshes of the wire sieve were too large, which I hardly think could be the case, for they were as close as fine muslin; be that as it may, it seemed that before the revolving blades had time to act on the latex it had all run through the sieve into the receptacle below. The appearance of the latex looked at from above was slightly frothy, but the consistence after an hour was apparently of equal density all through as tested by the feel of the water drawn off from the tap, and comparing it with the upper surface. Mr. BIFFEN who was the first to try and separate the rubber by centrifugalization says that some latices require a greater number of revolutions than others—9,000 per minute for Para whilst Castilloa separates readily at 1,000 revolutions per minute less. Unfortunately we had no time to wait any longer, we therefore took the latex in the machine to Malacca, and coagulated it in a manner, I shall presently describe. One cannot say much from this single trial of the machine for or against it—the principle is alright and I have no doubt that after a few experiments one would be able to use it with practical effect. One must remember that it is a washer and separator, and not a coagulator, and the difference between the two processes is this:—In coagulation a mass of rubber is obtained which cannot be again mixed up with water. In separation on the contrary, the particles have not been fused together, but still preserve their individuality, and the cream they form can be again mixed up with water to produce as it were latex again. Further trials are necessary with the machine which can alone prove whether it is suitable for Rambong latex or not, for while it may be suitable for Castilloa owing to the globules of Caoutchouc being larger, and separating more readily than others; it may require some modification to make it suitable for Rambong and Hevea latices.

I now turn to another interesting point, *viz.*, the method of tapping; and the amount of latex produced from a certain number of trees. As regards the method of tapping, we tried a new kind of tapping knife invented by Mr. TAN CHAY YAN, which consisted of a chisel-like blade being fixed at an angle into a brass socket head and regulated by means of screw nut, as to the depth of the incision.—The makers had not quite carried out their instructions, inasmuch as the blade was far too wide (about ½ inch) and the cutting edge was not shaped properly, and so we had to fall back on ordinary pocket knives. The bark of these young Rambong trees is however, so soft, that a good knife is a very good tool for making the incisions. As regards the shape of the incisions we began by making the well known vertical grove with oblique shaped cuts running into it. It was quickly observed that the

more perpendicular the cut the less latex flowed, and *per contra* the more horizontal the cut the greater the flow. We therefore abandoned the original method and simply made a broad V, shaped incision fastening a small $\frac{1}{4}$ lb. tobacco tin at the apex of each .V: In all some fifty-five trees were tapped, and nearly 150 tins were used, averaging 3 tins per tree. Many of the last attached tins, however, had very little or no latex at all in them. We begun to tap at 8.30 A. M. with six Chinamen, and at 11.30 began collecting the tins, beginning of course with those first attached, and it was noticeable that the early tins had the greatest quantity of latex, and the trees cut after 11 A. M. scarcely flowed at all. It is therefore suggested that daylight is the best time to commence tapping keeping on till, say, 9 a. m. In all we collected three and a-half imperial pints of pure latex, which we brought to Malacca, where Mr. TAN CHAY YAN coagulated it by boiling, ordinary earthenware chatties were used, over a wood fire, and the diluted latex was constantly stirred whilst boiling. After about an hour's boiling, the rubber becomes coagulated into a mass, and is taken out and thrown into cold water, after which it is pressed to get rid off as much water as possible. Three separate boilings gave the following results:—the $1\frac{1}{2}$ imperial pint taken from the centrifugal machine gave 14 ozs. of dry rubber; a second pint boiled separately gave $7\frac{1}{8}$ ozs. and the third pint yielded $10\frac{3}{4}$ ozs. The water was quite turbid indeed milky when the rubber was taken out after a little more than an hours boiling, shewing that all the rubber had not been taken indeed that was so for I was informed that boiling the water $2\frac{1}{2}$ longer gave an additional $2\frac{1}{2}$ ozs. of rubber.

So that we arrive at the following results:—

Name of tree.	Age of tree	No. of trees tapped.	Average No of incisions per tree.	Quantity of latex obtained.	Duration of latex flow.	Length of boiling.	Amount of dry Rubber.	Add Scrap Rubber subsequently taken from trees.
Rambong Ficus Elastica.	$5\frac{1}{2}$ years.	55,	3.	$3\frac{1}{2}$ imp. pints.	1.3 hours.	1,2 hours.	2 lbs. 10 ozs.	$8\frac{1}{2}$=total 3 lbs. $2\frac{1}{4}$ ozs.

Now as regards the number of trees tapped our object was not to see how much rubber we could get from one tree but rather to see how much marketable rubber could be got from a known quantity of milk in a given time. As regards the capacity of each tree yielding latex that must still be a matter for experiment, I feel convinced however, that the same quantity of rubber could be taken daily from the same trees for at least a fortnight.

Samples of the Rubber have been sent home for commercial valuation, also for an expert's opinion as to the method of preparation, for it must be remembered that the ordinary method of collect-

ing Rambong is to allow it to coagulate on the tree and then pulled off in strings which are wound into balls. In Mr. DERRY'S Report for 1900, he mentions that he sent home 5½ lbs. of Rambong Rubber prepared in this way which was quoted at 3/6 but which actually sold for 3/10 per lb. and was stated to be of good Java character. A small sample from Bukit Lintang which was submitted to a local expert was quoted as follows. "The sample of "susu" duly reached me I "estimate it commercially as a good "but not quite the best quality of ordinary "Borneo Rubber" "clean and well prepared value $145. to $160. per picul the pre-"sent value of No. 1 Borneo Rubber wet and dirty being "$125–$129, and Gutta Grip Merah known commercially as Penang "Rubber" No. 1, about $170.

This of course compares very unfavourably with the price obtained for Rambong as quoted by Mr. DERRY, and it will be interesting to find out whether the difference in price is caused by the different method of preparation or that the quality of the rubber yielded by the 19 year old trees tapped by Mr. DERRY, is so much better. In a future number of the Bulletin the home Report will be given on the samples sent and we shall then be in a better position to judge the cause of the wide discrepancy in price.

GUTTA JELUTONG.

Gutta Jelutong is obtained from a large tree (Dyera costulata) the wood of which is used for clogs, planks, and other purposes. It is fairly common in many parts of the Malayan region. Some few weeks ago a sample of this Gutta was received from the Senior District Officer, Province Wellesley, and sent to the Director Royal Gardens Kew who submitted it to the well known London Brokers Messrs. HECHT LUIS & KHAN, who reported on it as follows. "Gutta Jelutong is known on the market here as Pontianak and is worth to-day about £19. per ton. It generally arrives here in large brick-shaped lumps and we have never seen it in the form of your sample which also has not the peculiar smell that Pontianak has. We should estimate the value at about £19-£20. per ton." As will be seen from this, Jelutong is a low grade article of no great value, but as the trees are often cut for conversion into planks &c., the gutta as a secondary source of profit is at least worth attention. The wood is white, soft, and extremely light, specially adapted for drawing boards and postal boxes. It is doubtful whether Gutta Pontianak is the product of Dyera costulata only, it is more probably an admixture, as is the case with the majority of the Guttas and rubbers of commerce.

Mr. VICE CONSUL TEMPLE'S REPORT ON THE STATE OF AMAZONAS FOR 1899,

Continued.

SHIPMENT OF THE RUBBER.

The rubber having been prepared it is shipped from the estates in "balls" or "pellets" to merchants in Manaos, and by them sold to one or other of the export merchants in the same condition as received. By the export merchant it is cut up into small pieces the "Fine" separated from the "Entrefine," and then packed in wooden cases, each case holding about 170 or 160 kilos. It is then shipped to Europe or the United States as the case may be. Owing to the loss of weight already mentioned each merchant is obliged to have his own store, as no warehouseman could give a receipt for a quantity of produce the weight of which is constantly varying. For the same reason rubber is rarely sold by auction.

The commercial system by means of which the working of rubber estates is effected is somewhat complicated. Goods are in the first place imported from abroad by one class of merchants named "Importadores." In Manaos and Para most of these are at present Portuguese houses. They usually buy on 90 days' credit. The goods are then sold on the Manaos market to another class of merchants named "Aviadores," who generally buy on a 12th months' credit. These "Aviadores" then ship the goods up country to the estate owners. The "Aviador" business is chiefly in the hands of Brazilian and Portuguese firms. The estate owners then barter these goods to the men working their estates, who are not so much labourers as small tenants, the rubber trees being leased to them, for the rubber which they extract, paying them any difference that may remain to their credit, over and above the value of the goods supplied to them in cash. This rubber is then shipped by the estate owners to the "Aviadores" in payment of the goods that have been consigned to them. The "Aviadores" on receipt of the rubber sell it without delay to avoid loss in weight, to one of the exporting firms, receiving payment at once in cash. With this the "Aviadores" pay the "Importadores." The exporting house cut, pack, and ship the rubber drawing against shipments, generally on London credits, at 90 days' sight, and selling their bills to bankers at Para. Shipping documents have generally to accompany the draft, and in case of shipments to the United States, a certified Consular invoice. Manaos being without telegraphic communication, and consequently without foreign banks, the exporting houses which buy rubber on this market are obliged to keep a supply of cash in hand to pay for rubber bought, which as has been already stated has to be paid for at once in cash. Such is the so called "Aviador" system, and so far it has been found to answer better than other methods of doing business. Suggestions have been made whereby it is proposed to eliminate some of these middlemen, and to bring the consumer into closer contact with the

producer. In order to study this question it is necessary to consider the condition under which the rubber estates are at present being explored and worked.

The Hevea Braziliensis, is, as has already been stated, scattered through the Amazonian forests. In some places it is much more frequently met with than in others. Nothing but actual exploration and trial will enable the most experienced person to form any reliable opinion as to the value of a block of forest. The manner in which explorations are conducted is as follows:—An individual who enjoys a certain amount of credit in Manaos charters a small launch and freights her with a cargo of food, clothing, and implements necessary. He then proceeds to search in the low class hotels and boarding houses at Manaos and Para, or perhaps he may even go to the State of Ceara whence the labouring classes are chiefly recruited, for a number of men with whom he intends to work his estate. These he engages, not on wages but on the condition that he will barter his goods for the rubber they extract. Most of these labourers draw a considerable advance before they can be persuaded to go up country. With this cargo and crew he proceeds to the district where he intends to work. Having arrived at a place which he considers promising, he despatches some of the most practised labourers, or "Seringueiros," as they are here named, to explore the forest, find the rubber trees, and open the paths between them. With the remainder he builds a store, known as the "Barracao," in which he stores his goods, and which becomes a rendezvous or nucleus for the colony. The men all this time are living at their own expense, the price of supplies given to them being debited to their account, to be paid for in rubber latter on. The forest having been explored, the trees located and connected by paths, known as "Estradas," the men select which they are going to work. Each "Estrada" makes a loop, visiting generally some 100 or 150 trees, and returning to the starting point, generally on the bank of a river or stream navigable for canoes. Each man builds his own small hut, or "Baraca," where he lives and from which he works the two "Estradas" which he has selected. From time to time he pays visits to the central store to obtain goods, and deliver the rubber he has collected. This the owner of the store, or the "Patron" as he is termed, buys from him at a price, generally fixed by the "Patron" himself and credits him with the amount as a set off against the goods that have been supplied to him. As the "Seringueiros" can, as a rule, neither read nor write, the opportunities of an unscrupulous "Patron" are great. As the end of the season, that is to say, in January, most of these men return to Manaos. A fresh lot is generally taken up by the "Patron" each year.

The labourer or "seringueiro" spends his day much as follows. Rising from his hammock just before day break he takes a cup of black coffee. He then proceeds to tap the trees in one of the "estradas," affixing at the same time the cups to catch the latex as it exudes. The necessary cups are placed at the foot of each tree at the time that the "estrada" is being opened. By 9 A.M.

he has tapped the trees and is back in his hut. He then proceeds to cook and eat a scanty meal. At about 11 A.M., he again visits the trees taking with him a vessel into which he pours the contents of the cups. By 1 P.M., he is again in his hut. He then proceeds to smoke the latex he has collected during the day. The latex cannot be left standing over night, as fermentation sets in "entre-fine" rubber is the result. It is almost invariably, therefore, smoked each day as collected. By 2 or 2.30 P.M., he has generally finished his day's work and can spend the rest of his time in idling, hunting, or fishing as he pleases. On the following day he rests the "estrada" which he worked the day before and works the other. An active man sometimes works four "estradas," two each day. Such men are known to produce as much as 1 ton of rubber in the season. It is on such performances as these that calculations quoted in prospectuses of rubber companies distributed in the United Kingdom seem to be based. They are, however, quite erroneous when applied generally. In a good place an average man will make as much as 4 kilos. of rubber in a day, but it must be remembered that he does not work all the year round, and that he loses many days when it is raining or when he thinks it is goining to rain. Any excuse is good enough to prevent a "seringueiro" from goining into his "estrada."

The season during which the "estradas" are worked lasts from August till the begining of January. During the remaining months of the year there is generally too much water in the forest to allow the "seringueiros" to enter the "estradas."

When considering the question as to whether British Companies have here a good opportunity for the investment of capital the following points should be borne in mind. Rubber is brought down to Manaos at the present day from beyond Iquitos in Peru, and from beyond Orton on the River Beni in Bolivia, and goods are shipped to there from Manaos. A glance at the map will show how remote are these places. It is reasonable to suppose that natives of the country, who well understand the matter, would not go and explore so far a field if workable forests existed nearer home. The fact of their doing so, points to the probability that most of the forest worth obtaining in the neighbourhood of Manaos has already been taken up. Of course this does not mean that a company could not purchase already opened up estates, in good condition and do good business with them. But again certain difficulties to be encountered should be remembered. The greatest of these is the quantity and quality of the available labour supply. A company would have to work on a large scale and have a well ordered system. The labourers to be found in Manaos are an extremely independent, not to say unruly class, and although the comparative rarity of crime up country speaks well for their conduct on the whole, yet they are so unused to obey any sort of discipline that it would be very hard to work with an organised estate, especially as there is practically no legal authority outside the towns and every man's will is, up country, a law unto himself.

For the individual enterprise of that class of men which has done so much in opening up other tropical countries, men of resource and adaptability who prefer a rough life, there is probably a good field in Amazonas. Beginning, as they naturally would, on a small scale, and extending their business, they could probably do well. When the way has been opened by these, and a class thus created who really understand the business, there will be more opportunities for companies to work with success. It must be remembered that at the present time rubber export merchants have many difficulties to contend with. There is considerable competition in their business, and there are the unending and baffling variations in exchange. A company that owned rubber forests on a large scale could avoid exchange transactions almost entirely. The necessary goods imported would be paid for in London by the results of the sales of the rubber produced. Moreover once a rubber estate is in good working order it should be possible to make very certain calculations as to its annual yield. Taking these points into consideration, it would appear that the natural extension of the rubber merchant's business will be in the direction of securing the actual forests and lands in order to control the supply. No doubt means will be found eventually to overcome the difficulties stated above.

Owing to the recuperative power of the tree it is improbable that the available supply of rubber from the Amazon Valley will be exhausted in the near future. Also the enormous area over which the estates extend, makes it unlikely that unexpected events should occur by which the industry as a whole would be damaged, although, no doubt, local checks may be expected from time to time to occur. For the same reason and owing to the scarcity of labour, it is improbable that any very sudden increase or decrease of the annual production will occur. The tendency is at present for a slight increase of the total production each year.

The best district in Amazonas is commonly reputed to be that of the River Acre and the headwaters of the Purus.

Two British companies are at present established in the Amazon valley, namely the Para Rubber Estates Limited and the Amazonas Rubber Estates Limited. The former have an already opened estate in the islands near Para, whilst the latter are breaking in virgin forest on the headwaters of the River Teffe in the State of Amazonas.

Beside these, a Belgian company named "La Bresilienne" working an estate near Para, whilst a French company, the "Comptoir Colonial Francais," is working some estates on the River Javary. Several other French, German, and Belgian companies are said to be about to be organised for the same purpose.

Caucho is a vegetable product similar to rubber in many of its qualities, but inferior to it in usefulness. It is obtained by tapping trees much in the same way as rubber. The tree from which it is obtained is a variety of the "Castilloa." This tree prefers drier parts of the forest than the Hevea.

Owing to the fact that the laticiferous system is not connected

throughout the tree, it is not possilbe to drain all the latex by tapping only a small area of the bark, as is the case with the Hevea. The tree has, therefore, to be cut down in order that the whole tree, including the branches and twigs, may be tapped. The roots also, which often project above the ground, are tapped. I am told that it takes as much as 15 days for the whole of the latex to exude from the tree. The latex is collected first in small cups placed to receive it, and subsequently is poured into a suitable vessel, or sometimes into a trough cut in the tree itself or into a hole made in the ground. A small quantity of soap solution is added to it to produce a more rapid coagulation. The juice of a creeper named "Vitelha" is generally added for the same purpose.

When the latex has coagulated, which takes some days, the mass is taken out and caucho "Slabs" are thus formed. Caucho "Balls" are made by rolling up strips of the coagulated latex that has exuded from cracks in the bark. By common accounts an average caucho tree will yield from 30 to 40 lbs. of caucho including the scraps.

Owing to the fact that the trees are cut down and destroyed, the collectors, or "Caucheros" as the are called, are constantly moving about to discover fresh trees. Whereas at one time nearly all the caucho came from Peru, it is now more extensively worked on the Javary. During 1899 a large amount was also received from the Purus. The actual work of exploring and tapping caucho trees is still done chiefly by Peruvians even in Brazil, the Brazilians preferring to work the hevea.

PARA RUBBER IN THE STRAITS SETTLEMENTS.

To the Editor of
THE INDIA RUBBER WORLD:

A few weeks ago I posted you a copy of the Annual Report of the Botanic Gardens in this Colony, containing, among other rubber notes, the result obtained by tapping a single Para Rubber tree (Hevea Brasiliensis) growing in the Waterfall Botanic Garden, Penang. The result of four tappings within two years, as shown in that report, is 12½ pounds of dry, marketable rubber. Within the past month the same tree has been again tapped, and yielded over 2 pounds more, so that this one tree has given 14½ pounds, without being excessively tapped. How long it will continue to yield at this rate is a matter of conjecture, but so far as can at present be seen there has been no apparent injury to the tree. I am sending you by post a sample of the rubber and shall esteem it a favour if you will kindly submit it to some expert engaged in the manufacture of rubber goods for an opinion as to its quality and value.

In a few years' time this will be a large article of export from this region, and also what is known here as "Gutta rambong" (Ficus elastica.) Many large plantations here and in the adjoining

Federated Malay States were commenced about four years ago, and tapping on a large scale is anticipated by the time the trees are eight years old. New plantations are being formed as fast as seeds are obtainable, but the supply is not equal to the demand. The tree from which the rubber I am sending you was taken is sixteen years old, but in good soil such as most of the planters are using, the trees will be quite as large in eight or ten years. Ours is growing on a dry gravelly bank, conditions quite the opposite of those under which it naturally grows, so far as one can judge from the reports of those who have seen it growing in Brazil. Here it will grow anywhere, though of course not equally well in all places, and there is no doubt that in the future this country will have to be reckoned with as regards rubber. As a field for investment in this particular cultivation it would be hard to beat. Land is abundant and cheap and roads, railways and rivers afford easy access to all parts of the Malay Peninsula.

C. CURTIS, F.L.S.
Superintendent of Forests Section
Botanic Gardens, Penang,
Straits Settlements.

September 24th, 1901.

COMMENT BY THE EDITOR

The tree from which was obtained the sample of rubber referred to above was stated, in the annual report of the botanic gardens for 1900, to be 55 feet high, with a circumference, at 3 feet from the ground, of 66 inches. The record of yield of this tree, as stated in the annual reports, is as follows, the tree having been tapped for 14 alternate day as in each of the seasons mentioned.

	lbs.	oz.
November-December, 1898 ...	... 3	0
April-May, 1899	... 2	8
November-December, 1899 ...	... 3	4
October-November, 1900 ...	... 3	12
August-September, 1901 ...	... 2	0
Total	... 14	8

From the same reports it is to be inferred that the rubber produced has been smoked with coconut husks after first having been allowed to coagulate and then rolled into thin sheets. Where the rubber milk has happened to contain rainwater, alum or spirits of wine has been used to hasten coagulation. The method of coagulating rubber on the Amazon is by submitting the fresh latex to the hot smoke of palm nuts, quite a different method from that employed by our Penang correspondent.

The Penang rubber has been examined quite carefully, and is worth about 60 cents a pouud, with fine Para at 80 cants a pound. In fact it does not resemble fine Para very strongly, but is much more like Pernambuco. The rubber is much softer than fine Para, or even than coarse Para, and has nowhere near as strong fiber. In

fact, it is quite short. It could not be used, for example, in thread, bands, or any fine pure gum goods. In solution it loses its tenacity very quickly, so that it would not do for high grade cements. Another thing about it is that it softens with age, whereas the Para rubbers grow hard and oxidize. We think the reasons for these differences are two: one being found in the manner of coagulation, which does not seem equal to the smoking process; and the other being due to the undoubted change wrought upon the tree by a different climate from that in which the tree naturally flourishes. It is to be understood, of course, that the rubber is valuable, and will find a ready market at a good price, but it is not the equal of either fine or coarse Para. We think this is another proof that rubber will be cultivated most successfully in the regions where it grows wild.

CORRESPONDENCE.

To the Editor,
AGRICULTURAL BULLETIN.

Dear Sir,—Reading the notes on the value of Incidental Increment of Plant food in Soils in the last issue, I am inclined to add the following note on the same subject. There is nothing new in it nor am I confident that it deserves publication.

I remain,
Yours sincerely,
V. K. MEARON.

18th December, 1901.

INCIDENTAL INCREMENT OF PLANT-FOOD IN SOILS.

The rapid decomposition of organic matter in Tropical Soils tends to keep the nitrogenous portion of the plant-food in them at a minimum, and analysis often shows a comparatively low percentage of nitrogen. But Nature herself, as if to compensate for the rapid decomposition of organic nitrogenous matter, has provided the Tropics with an increased number of species of Leguminous plants especially of Papilionaceous Sub-order. The roots of these plants serve, through the agency of minute organisms that live in the roots and the soil, as a medium for rendering atmospheric nitrogen available to plants. Though this theory is pretty recent the importance which leguminous crops possess as valuable fertilizers of soil has long been recognized by farmers, both in the East and the West. Hence the invariable rule of inserting one or more leguminous crops in a System of Rotation of crops. But we are not generally aware of the full importance of the part played by leguminous crops in the incidental increment of plant-food in soils. Either in forests, plantations, gardens or even on waste lands, many of the plants which are classed as weeds are important means of nourishing the soil. Leguminous

crops and leguminous weeds co-operate in certain respects with the farmer, but often without the latter recognising their help. This, in certain cases, accounts for the notable fact that in the Tropics a soil which, from a European point of view, is very dificient in nitrogen, is capable of supporting vigorous growth of plant-life. The subject of incidental increment of plant-food in soils is one of extreme importance, and moderate methods of scientific enquiry have hardly reached the threshold of it. We have but begun to doubt the absolute correctness of the existing methods of estimating the fertility of soils.

SINGAPORE MARKET REPORT.

December, 1901.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	10	33.00	32.00
Bali	6	27.75	27.50
Liberian	120	22.00	21.00
Copra	1,548	10.00	8.80
Gambier	1,537	16.75	13.00
Cube Gambier, Nos. 1 & 2	125	20.87½	15.00
Gutta Percha, 1st quality	...	600.00	450.00
Medium	...	450.00	300.00
Lower	...	200.00	50.00
Borneo Rubber, 1st, 2nd, 3rd	...	130.00	74.00
Gutta Jelotong	...	7.25	7.00
Nutmegs, No. 1	...	48.00	48.00
No. 2	...	66.00	65.00
Mace, Banda	...	88.00	80.00
Amboyna	...	66.00	66.00
Pepper, Black	259	34.25	31.62½
White	55	54.50	51.50
Pearl Sago, Fair	135	4.90	4.25
Medium	...	5.00	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	1,430	3.80	3.52½
No. 2	270	3.40	1.90
Flake Tapioca, Small	738	8.30	5.25
Medium	10	6.00	5.25
Pearl Tapioca, Small	199	6.25	5.00
Medium	1,097	7.75	5.40
Bullet	...	6.50	6.00
Tin	1,610	69.75	64.25

London Markets.

(Per Mail advices of 20th December, 1901.)

Coffee.

The London Commercial Record says:—As usual at this period of the year there have been only small supplies offered at auction, with the exception of "Dumont" Santos. New crop Costa Rica sold with good competition at very full prices. No appreciable change in value generally can be reported, and with the small solitary auction yesterday public sales closed for the year, and will not be resumed till 7th January, 1902. The market for "futures" opened with a stronger tone, owing to more moderate receipts and strong Continental buying, and the price of March Santos advanced to 37*s*. 9*d*. but later values gave way, and the closing quotations show a decline of 1*s*. per cwt. from the recent highest point; yesterday May delivery sold at 37*s*. 3*d*. and September at 38*s*. 9*d*. to 38*s*. 6*d*. per cwt. We quote:—

London ...	Santos ...	March delivery	36*s*. 9*d*.
New York ...	No. 7 Rio ...	,,	6.80 cts.
Hamburg ...	Santos ...	,,	35¾ pf.
Havre ...	Santos ...	,,	45¾ francs.

Imports, Deliveries and Stock of Coffee in London are as follows:—

	Stock.		Imports.	
	1901.	1900.	1901.	1900.
Tons ...	11,944	14,938	44,847	34,858

	Home Consumption.		Export	
	1901.	1900.	1901.	1900.
Tons ...	19,230	16,170	28,209	18,390

The preceding figures exhibit		Tons.
In the Imports an increase this year of	...	9,989
Home Consumption an increase of	...	3,060
Export an increase of	...	6,891
Stock a decrease of	...	8,612

Details of this week's auctions are appended:—

Ceylon.—Plantation.—3 casks 2 tierces 10 barrels I bag sold, smalls 48*s*. to 50*s*. good middling 98*s*. to 98*s*. 6*d*. bold 106*s*. 6*d*. to 118*s*. peaberry 125*s*.

Mocha.—82 half-bales withdrawn.

Singapore.—8 bags Liberian bought in.

Costa Rica.—Of 874 bags offered only 230 bags sold, small 44*s*. to 56*s*. middling to good middling 64*s*. to 74*s*. fine middling 82*s*, good to fine bold 80*s*. to 95*s*. 6*d*. peaberry 60*s*. to 78*s*. 6*d*.

Guatemala.—Of 188 bags offered 60 bags sold, smalls 38*s*. to 39*s*., fine ordinary brownish 46*s*., low middling dull greenish 50*s*. 6*d*., peaberry 46*s*. to 46*s*. 6*d*.

Colombian.—Of 534 bags catalogued 450 bags sold, part damaged, smalls 34*s*. 6*d*. to 49*s*., low middling brownish to middling

greenish 48*s.* to 55*s.* 6d., good middling 57*s.* 6*d.* to 60*s.* 6*d.*, good bold 67*s.* 6*d.* to 68*s.* 6*d.*, peaberry 49*s.* to 62*s.*

Brazil.—Of 995 bags washed Santos 350 bags sold, smalls 37*s.*6*d.* to 39*s.*, middling 49*s.*, good bold 55*s.*, peaberry 39*s.* to 52*s.* Of 4,255 bags unwashed Dumont Santos, quay terms, 560 bags sold, smalls 37*s.* to 37*s.* 6*d.*, medium 38*s.* to 39*s.*, peaberry 39*s.*

Receipts in Rio and Santos:

	1901–2. Bags.	*1900–1.* Bags.	*1899–00.* Bags.	*1898–99.* Bags.
Rio	...3,446,000	1,580,000	2,046,000	1,681,000
Santos	...6,738,000	5,195,000	4,444,000	3,609,000
Total	10,184,000	6,775,000	6,490,000	5,290,000
Crop ...	...	10,900,000	8,971,000	8,772,000

Rio Exchange ... $12\frac{23}{32}d.$, previous day $12\frac{19}{32}d.$

Havre, December 19.—Good average Santos December opened barely steady at 45f. and closed quiet at $44\frac{3}{4}$f., March opened at 46f. and closed at $45\frac{3}{4}$f., May opened at $46\frac{1}{2}$f. and closed at $46\frac{1}{4}$f., July opened at $47\frac{1}{4}$f. and closed at 47f., September opened at 48f. and closed at $47\frac{1}{2}$f.

Hamburg, December 19.—Good average Santos December opened quiet at 36 pf. and closed barely steady at $35\frac{3}{4}$ pf. March opened at $36\frac{3}{4}$ pf. and closed at $36\frac{1}{2}$ pf., May opened at $37\frac{1}{2}$ pf. and closed at $37\frac{1}{4}$ pf., July opened at 38 pf. and closed at $37\frac{3}{4}$ pf., September opened at $38\frac{1}{2}$ pf. and closed at $38\frac{1}{4}$ pf.

New York, December 19.—Closing prices of No. 7 Rio were as follows:—

	Dec.	Jan.	Feb.	Mar.	April.
December 19,	6.60	6.60	6.70	6.75	6.85
December 18,	6.65	6.70	6.80	6.85	6.95

Tea.

Indian.—Auctions included 42,500 packages, opposed to 48,900 packages in the week previously, and 42,500 packages for the corresponding time of 1900.

Bidding was brisker for all sorts, and though quotations for medium and fine were without material alteration, there was a firmer tone for the lower kinds, which were slightly dearer, there being very little Pekoe Souchong under $5\frac{3}{4}d.$ per lbs.

The statistical position shows further improvement, deliveries of all Tea from the 1st to the 17th instant being nearly $1\frac{1}{2}$ million lbs. over those of the same interval last year; while the shortage in the supplies of British grown Tea is being more accentuated.

The Regulating Committee has recommended that no Public Sales be held until Wednesday, 1st proximo., and Thursday, 2nd proximo.

For 36,900 packages on estate account $7\frac{5}{8}d.$ per lb. was obtained, contrasted with $6\frac{3}{4}d.$ per lb. for 38,800 packages, and $8\frac{1}{8}d.$ per lb. for 35,300 packages in the two preceding seasons.

Totals printed for importers were .—

1901.	1900.	1899.
129,200 packages.	142,300 packages.	124,300 packages.

making 784,000 packages of the present crop offered to date *versus* 876,000 packages in that period of 1900, and 902,000 packages in 1899.

Ceylon.—A similar quantity to last week was catalogued, viz., 19,800 packages and 20,800 packages; a twelve-month since 29,100 packages were submitted.

The sale attracted good competition, and there was not much change in prices to record. Common grades were in strong request, and here and there hardened fractionally in value; other descriptions, however, were less wanted and ruled irregularly, but on the whole remained about steady. Not many fine invoices came to hand, and for the most part quality was barely maintained.

The average is 7½*d.* per lb. On the 12th instant it was a trifle over 7½*d.* per lb. and 7⅛*d.* per lb. in 1900.

Printed in December.—

1901.	1900.	1899.
69,600 packages.	73,500 packages.	56,200 packages.
(Average 7½*d.* per lb.)	(Average 7⅜*d.* per lb.)	(Average 7¾*d.* per lb.)

From 1st January to 31st instant 1,188,500 packages yielded about 7*d.* per lb. compared with 7¼*d.* per lb. for 1,263,200 packages, and Colombo telegrams give shipments to the United Kingdom for the fortnight as 3,800,000 lbs. and the estimate for December varies from 8 to 10½ million lbs.

Java.—Nearly 1,200 packages of direct import were placed before buyers, and received increased attention, rates being fully upheld, especially in the case of Teas under 7*d.* per lb.

For the month the undermentioned were put forward:—

1901.	1900.	1899.
4,100 pkgs.	2,800 pkgs.	2,000 pkgs.
(Avge. 6¾*d.* per lb.)	(Avge. 6¼*d.* per lb.)	(Avge. 6⅞*d.* per lb.)

Deliveries.—Clearances of all tea (on which duty has been paid) from the London warehouses, as per official returns are, viz.:—

From 1st to 17th December,		1901	...	12,716,600 lbs.
Do.	do.	1900	...	11,362,076 ,,

During the week the following have been printed for sale by public auction:—

	Sold Pkgs.	Withdrawn Pkgs.	Total offered Pkgs.
India	37,777	4,778	42,555
Ceylon	17,296	2,548	19,844
Java	1,053	108	1,161
Total	56,126	7,434	63,560

Also 811 packages from second hands.

Messrs. GOW, WILSON and STANTON'S Indian, Ceylon and Java Tea Report, dated December 20th, 1901, says:—

Quantity Brought to Auction in London from 1st June to Date

	Indian Pkgs.	Ceylon Pkgs.	Java Pkgs.
1901-1902	868,888	662,191	38,396
1900-1901	907,277	718.189	29,990

43,606 pkgs. Indian
20,214 „ Ceylon
1,161 „ Java.
Total 64,981 packages were offered in public auction this week.

According to most recent telegrams, shipments from Calcutta and Colombo to the United Kingdom are each about 10 million lbs. behind those to same date last year, making a total shortage in the exports to this country at the present time of about 20 million lbs. whilst Home Consumption and re-exports from this country of Indian and Ceylon Tea to the end of November show an increase of over 13 million lbs.

The statistical position is thus at length assuming a much more satisfactory phase than has been the case this season, and fully warrants the stronger tone recently noticed in the market.

The last sale of Ceylon Tea before Christmas was held on the 17th instant, and of Indian Tea on the 19th instant. The next public sale for Indian Tea will be held on the 1st and of Ceylon Tea on the 2nd proximo.

Indian.—General firmness characterised the market, especially noticeable in Teas for price, although other grades were fully up to the best prices of last week, with competition fairly general throughout the auction. The official wire from Calcutta gives the exports to U.K. for first half of December (including Chittagong) as 9,060,000 lbs. against 12,010,000 lbs., making the total from 1st April to that date 127,641,800 lbs., against 137,430,000 lbs. in 1900.

The following average is worthy of note :—" Tara T Co., " 1/1 week's av. of New Season's tea sold on Garden Account 1901, 36,617 packages av. 7.57*d.* 1900, 38, 592 packages, av. 6.70*d.*

Ceylon.—The tendency of the market has been towards dearer rates especially for Teas under 7*d.* per lb., other grades also evincing a strong demand. The general quality of arrivals is hardly what it was a few weeks back. Private telegraphic advice states the quantity shipped from Ceylon to U.K. for first half of December as 3,800,000 lbs., against 5,500,000 lbs., making the quantity from 1st January to that date as 98,800,000 lbs., against 108,750,000 lbs. last year. Average for week 7.45*d.*, against 7.14*d.* same week, 1900.

Ceylon tea sold on Garden Account 1st January to date, 1,102,005 packages, av. 6.86*d.* 1900, 1,194,536 packages, av. 7.20*d.*

Java.—The market was strong for all descriptions. Teas for price again showing an advance.

Pepper.

Black.—The market has been very quiet, and prices are lower in all positions. On the spot retail sales have been made at $6\frac{3}{16}d.$ for fair Singapore on the spot, and 50 tons for arrival, including January—March shipment at $6\frac{1}{4}d.$

At auction on the 18th instant, 359 bags Penang were bought in at $5\frac{7}{8}d.$ also 98 bags Singapore at $6\frac{1}{4}d.$ and 120 bags Aleppy at $6\frac{1}{4}d.$ per lb.

The shipment of Black Pepper for the first half of December compare as follows:—

	1901.	1900.
U. K. Singapore	... nil.	... nil.
„ Penang	... nil.	... nil.
Continent	... 90	... 120
U. S.	... 130	... nil.
Total tons	... 220	... 120

White is firm. Sales of fair Singapore have been made at 9*d.* and of fair Penang at 9*d.* For arrival Singapore December-January shipment has been done at 9*d.* and January-March at 9*d.* per lb.

The shipments of White Pepper for the first half of December compare as follows:

	1901.	*1900.*
United Kingdom, Singapore	... 80	Nil.
Do. Penang	... 30	Nil.
Continent ...	... 30	70
United Kingdom ...	... 30	.
Total	170	70

Ginger.

Cochin.—There is no sign of improvement in the demand, but holders still adhere to recent asking rates. 403 bags were brought forward, and passed the hammer without a bid; medium and small washed rough at 50*s.*, D's at 46*s.* per cwt.

Japan.—30 bags medium and small limed bought in at 45*s.* per cwt. To arrive business has been done in rough Calicut D's at 38*s.* per cwt. c.i.f., ex January-March (s.).

Cardamoms.

Only 11 cases offered, for medium to boldish pale Ceylon-Mysores 2*s.* 7*d.* was paid, 2*s.* 2*d.* for small to medium ditto, small 1*s.* 8*d.*, very small pale 1*s.* 4*d.*, medium splits 1*s.* 8*d.* and small ditto. 1*s.* 4*d.* per lb.

Ten cases of pale seeds were held at 2*s.* and a further 8 cases were not ready in time.

PLANTING OPINION,
Madras, January 11, 1902.

Gambier.—Fine pale cubes have been sold on the spot at 42*s.* 6*s.* per cwt., but for quantity this figure may be shaded; for December-January shipment 36*s.*, c. i. f. is quoted.

Gamboge.—Nothing was offered in auction to-day, and, as will be seen from the figures below, the exports from Singapore have been exceptionally small. There are 98 packages in the warehouse, but the bulk of them are small in size.

The exports from Singapore from January 1 to October 31 (in piculs) have been:—

	Great Britain		U. S. A.
1901	... 15	...	66
1900	... 50	...	119
1899	... 192	...	124
1898	... 214	...	95
1897	... 226	...	110
1896	... 118	...	15

Gum Arabic.—In East Indian gums sales privately have been made at 23*s*. 6*d*. per cwt. for good palish unsifted brown Amrad, middling Ghatti at 15*s*. 6*d*. and ordinary to good ditto 11*s*. to 13*s*.

Spices.—The market is quite, and there is very little business to note this week. The auction on Wednesday were small, and nearly everything was bought in, the exception being Nyassaland Chillies, which sold with good competition, but at easier prices, good to fine bringing 44*s*. to 47*s*. 6*d*.. and little mixed 40*s*. to 42*s*. 6*d*. per cwt., common dark stalky Zanzibar were bought in at 35*s*. per cwt. Nyassaland *Capsicum* sold at 24*s*. per cwt. for cherries, at 28*s*. for medium pods, and at 50s. for long pods. All the parcels of Ginger were bought in, small rough Cochin at 46*s*. good washed rough at 52*s*., and rough limed Japan at 45*s*. per cwt. Pimento firm, but quiet; only one lot sold at 3⅜*d*. per lb. for clean grey. Dull thin Singapore Mace was bought in at 1*s*. 6*d*. per lb. Zanzibar Cloves are rather easier at 4$\frac{5}{32}$*d*. per lb. for March–May delivery; fair Penang were bought in at 8½*d*. per lb. Pepper is quiet, and lower for black since our report last week, Singapore having been sold at 6¼*d*. per lb. for January–March shipment. The market, however, now shows a firmer tendency. At auction Penang was bought in at 5⅞*d*. and greyish Malabar at 6¼*d*. per lb. Singapore white was withdrawn at 10⅛*d*. per 1.

THE CHEMIST & DRUGGIST,
London.

The Weather.

The Returns for December shew that it was a fairly average month, there were no extremes, except, perhaps, in the case of the Rainfall at Pekan, where 24·46 inches of rain fell. Singapore was about the average with 8·77. Penang was comparatively dry 3·33 only being recorded. Malacca slightly under the average with 6·25. In Perak, the greatest amount fell at Tapah 11·02, and the lowest at Parit Buntar 3·42. Selangor recorded the highest at Kajang 8·47 and the lowest at Kuala Langat 4·90; whilst Pahang shewed the enormous difference between 24·46 at Pekan and 9·81 at Temerloh.

Singapore.

Abstract of Meteorological Readings for December, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall,	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum,	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·914	138·8	77·9	85·7	71·3	14·4	75·8	·837	74·4	81	N. E.	8·77	1·62

K. K. Hospital Observatory,
Singapore, 14th January, 1902.

A. B. LEICESTER,
Assistant Surgeon and Meteorological Observer.

Penang.

Abstract of Meteorological Readings for December, 1901.

District	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest rainfall during 24 hours.
			Mean dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Prison Observatory ...	29·858	147·2	80·2	90·0	73·5	16·5	74·1	·734	64·6	65	N.W.	3·33	1·52

G. D. FREER,

Acting Colonial Surgeon, Penang.

Penang, 7th January, 1902.

Malacca.

Abstract of Meteorological Readings for December, 1901.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital.	29·837	148·3	82·2	88·0	68·1	19·9	80·9	1·039	51·4	94	N.	6·95	·90

Malacca, 4th January, 1902.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1901.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	156	80·87	91	70	21	76·19	·842	80	6·32	1·89
Kuala Kangsar ...	...	80·92	91	68	23	76·07	·836	79	5·07	1·26
Batu Gajah ...	163	81·05	92	70	22	76·45	·852	80	7·75	3·35
Gopeng ...	...	80·32	91	65	26	77·16	·889	87	8·81	1·52
Ipoh ...	...	81·05	92	69	23	76·08	·831	78	6·71	1·36
Kampar ...	...	...	91	69	22	...	...	...	10·76	2·17
Teluk Anson ...	...	80·53	90	69	21	76·29	·852	81	9·42	2·70
Tapah ...	..	80·53	91	66	25	76·09	·838	80	11·02	2·92
Parit Buntar ...	...	81·07	91	70	21	76·34	·845	79	3·51	1·50
Bagan Serai ...	...	80·88	90	70	20	76·35	·847	80	11·01	3·42
Selama ...	...	81·66	91	70	21	77·21	·874	81	7·22	1·70

STATE SURGEON'S OFFICE,
Taiping, 17th January, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29·878	144·5	80·2	90·0	70·8	19·2	76·5	0·840	74·0	81	Calm	8·24	1·56
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	6·09	1·05
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	6·10	1·14
,, Klang	...	...	...	85·1	73·1	12·0	...	...	...	...	...	7·05	1·54
,, Kuala Langat	...	...	...	86·5	74·6	11·9	...	...	...	...	...	4·90	2·00
,, Kajang	...	...	...	84·1	75·5	8·6	...	...	...	...	...	8·47	2·66
,, Kuala Selangor	...	...	...	85·8	74·9	10·9	...	...	...	...	...	6·66	2·50
,, Kuala Kubu	...	...	...	89·3	72·1	17·2	...	...	...	...	...	6·67	1,10
,, Serendah	...	...	...	87·2	74·8	12·4	...	...	...	...	...	6·57	1·14
,, Rawang	...	...	...	85·4	73·2	12·2	...	...	...	...	...	8·05	1·87
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	7·01	1·90

State Surgeon's Office,
Kuala Lumpur, 20th January, 1902.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for December, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis - -	...	...	...	94·0	70·0	19.6	...	...	...	...	...	10·22	2.10
Raub - -	...	...	...	90·0	69·0	16.6	...	...	...	...	...	11·69	4·28
Bentong - -	...	...	...	90·0	66·0	22.0	...	...	...	...	...	11·26	2·80
Pekan - -	...	...	...	89·0	71·0	18.0	...	...	...	...	...	24·46	3·90
Kuantan - -	...	...	...	82·0	71·0	11.0	...	...	...	...	...	11·52	1·82
Temerloh - -	...	...	...	89·0	70·0	19.0	...	...	...	...	...	7.81	1.46

RESIDENCY SURGEON'S OFFICE,
Kuala Lipis, 14th January, 1902.

P. N. GERRARD, M. D.,
Acting Residency Surgeon, Pahang.

No. 6.] MARCH, 1902. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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SINGAPORE:
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at the Government Printing Office.

NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commerical value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

No. 6.] MARCH, 1902. [VOL. 1.

THE TIMBERS OF THE MALAY PENINSULA.

Continued.

RUBIACEÆ.

A large order containing but few large trees and none of any vast size, and of these few are large enough to give timber big enough for beams. The wood is usually yellow or white seldom red or dark brown.

Sarcocephalus Junghuhnii, Miq. Mangel, Chermin Ayer.

A fairly large tree with rounded opposite leaves and flowers in balls, yellow sweet-scented, about 30 or 40 feet tall and about a foot through, with rather thick bark. The wood is fairly heavy bright yellow when fresh turning brown, not very hard. The sapwood not very distinct. Pores large and small mixed, rays very close and fine, rings fairly distinct and regular narrow and almost poreless. Weight 40 lbs. 8 ozs.

A good ordinary building wood, durable.

Adina rubescens, Hemsley, Berombong.

A fairly large tree about 60 feet tall and 1½ to 2 feet through remarkable for the stem being irregularly perforated for some depth. Leaves small, flowers in small heads, bark ⅛ inch thick grey, sapwood at first pink fairly hard. Heartwood yellow, with distinct rings, rays very fine and close, pores mediocre scattered irregularly.

A hard and heavy wood excellent for building but the irregular depressions in the trunk make it difficult to get good beams. If good it is said to last 20 or 30 years in the ground. Weight 46 lbs. 5 ozs. to 49 lbs. 8 ozs.

Uncaria.

This genus of climbers is very well represented here, the best known being the Gambir, *Uncaria gambir*. Some of the other species are lianes of great size with very hard wood for lianes of a very curious structure dark brown in colour with very large pores partly full of some white substance.

These bigger lianes are useful in the jungles as water-vines, supplying when cut a good quantity of potable water.

Urophyllum.

A small genus of shrubs or small trees, seldom more than three or four inches through with white wood.

U. hirsutum, Wight.

White wood, fine grained with rather distinct fine rays, very small pores and fairly distinct rings. Weight 54 lbs.

U. glabrum, Wall.

Maingay says *Urophyllum* is the Kayu Gading, the wood is very pale whitish red or reddish white, grain medium, very hard, splits very slightly in drying. Used for the manufacture of Kris handles, and probably valuable for carving or wood engraving. Weight of a cubic foot 65 lbs. 8 ozs. It is a small common shrub.

The name Kayu Gading is applied to several plants which have white (lit ivory) hard wood. Chiefly species of

Canthium, *Petunga venulosa*, and also *Hunteria corymbosa.*

U. glabrum, Wall. is usually a small shrub, seldom big enough to get any wood out of.

Randia anisophylla, Jack. Simpoh Gajah.

A very common small tree attaining a height of about thirty feet, has a brownish white light wood, fine grained and smooth with small pores, and fine rays difficult to see, and no rings. It is used in house building for posts and rafters. Weight 43 lbs.

Gardenia tubifera, Wall. Delima hutan.

A fair sized tree with large orange coloured flowers sweet-scented "Wood white, grain fine medium, hard splits in drying, a cubic foot weighs 51 lbs. 9 ozs." (Maingay.) The wood is used for house building and is fairly durable.

Jackia ornata. Wall. Sintulang.

A small tree with hanging panicles of pink flowers very beautiful, grows in swamps, and attains a height of 70 or 80 feet with a straight stem.

The wood is hard fawn colour with fairly conspicuous rings and numerous moderately large pores. Weight 55 lbs. 4 ozs; 57 lbs. Used in house building also furniture (Veth.)

Scyphiphora hydrophyllacea, Gærtn. Chingum.

A low shrub or small tree growing with mangroves on the sea coasts.

Wood dark brown compact, fine grained rings obscure, pores exceedingly small and rays very fine. Weight 44 lbs. 15 ozs.

Canthium.

There are several species of this genus of small trees the wood of which much resembles that of coffee. The largest species is *C. glabrum*, Bl. about 30 feet tall.

C. didymum, Roxb. Butulang.

Is a small shrubby tree common near the sea coast with light brown or dull whitish wood, numerous fine rays and abundant moderate sized pores. A fairly good hard wood for small purposes. Maingay states it is used in boat building. Weight 54 lbs. 6 ozs., Singapore 43 lbs. 8 ozs.

Ixora spp. Pecha Priok, Siantan.

Well known ornamental shrubs or small trees, with red yellow or white flowers. The wood resembles that of coffee, white to light brown fine grained with conspicuous rings, exceedingly fine rays, and concentric lines broken up connecting them, pores very small Weight 55 lbs. 11 ozs.

I. concinna, Br.

The wood is chiefly used for walking sticks, but could also be used for many small purposes.

I. parviflora, Vahl.

Is used for furniture and house building in Southern India.

Timonius Jambosella Thw.

A common small tree with yellow flowers, abundant in secondary jungles.

Wood yellowish heavy, pores moderately large, rays very fine and close, rings faintly marked. Weight 44 lbs.

T. Rumphii, Dc.

Is very similar but rather lighter coloured, and the fibre is more wavy. Cubic foot 20 lbs. 2 ozs. Maingay.

Morinda tinctoria, Roxb. Mengkudu.

This is chiefly grown for its bark, which especially that of the roots is used for tanning and dyeing. It grows in waste ground and is usually a tree of about 20 or 30 feet tall, but I have seen a tree much larger.

The wood is yellowish brown, bright orange when fresh cut, close grained and rather soft, pores large and small mixed, the rays rather thick. Maingay gives the weight as 46 lbs. 7 ozs. per cubic foot, S. 40 lbs. 4 ozs. to 47 lbs. 8 ozs.

It is used for gun stocks in Java (Van Eeden.)

COMPOSITÆ.

The only tree of this order, is *Vernonia arborea*. Ham. "Merambong", which attains a height of 60 feet, and a diameter of about 18 inches or more. It has rather soft white or brownish wood, with conspicuous rays, and fairly large pores. It has a fairly good figure, though a dull coloured wood. It is used in housebuilding but is not considered very good. Weight 26 lbs. 4 ozs.

MYRSINEÆ.

Mæsa indica, L.

A small common tree, with compact light brown fairly hard wood with fine close rays and medium sized pores. Too small for much

use, but according to Maingay used for trenails in shipbuilding. Weight 54 lbs. 4 ozs. S. 50 lbs. 4 ozs.

Myrsine capitellata, Wall.

A small tree common on sea coasts, and in the hill regions.

Wood close grained, whitish fawn coloured close grained, pores very numerous crowded, rays fine, rings obscure. Weight 47 lbs. 4 ozs.

Ægiceras corniculata, Blanco.

A small tree or shrub in the Mangroves with light pale coloured close grained wood, no rings and very small pores chiefly used for firewood.

Sapotaceæ.

A large order, exclusively trees including several important timber trees and all the gutta producing trees, almost all the species contain a milky latex which contains a certain amount of Gutta but only a few are valuable.

Chrysophyllum Roxburghii, Don.

A tall tree with small leaves, and a globular angled fruit about an inch long containing much gutta which, however, is of little value. The fruits are eaten in India. There is a considerable difference between the Malay tree and the Indian one, and they may be distinct species.

The tree has a straight smooth stem with grey bark, and no buttresses. It attains a height of about 60 or 80 feet and a diameter of two feet. The wood is light coloured and soft with large pores in rows and somewhat distant rays.

It is used in building in India, and for kris scabbards here according to Maingay who gives the weight as 43 lbs. 4½ ozs., Singapore 39 lbs. 6 ozs.

Sideroxylon ferrugineum, Hook. Tuak-Tuak.

A small sea shore tree with stiff dark green leaves coppery beneath.

The wood is hard and heavy pinkish brown in colour with very fine rays, and wavy concentric lines, the pores are arranged in wavy lines radiating from the centre whiter than the ground colour and giving the wood a pleasing mottled appearance. Weight 57 lbs.

Dichopsis oblongifolia, Getah Taban Merah.

This and the closely allied *D. gutta*, Benth., give the best Gutta percha. The tree attains a height of about sixty feet, and a diameter of 2 feet. It is seldom much branched, and is not, as a rule, a very leafy tree. The growth is slow. The tree is easily recognized by its lanceolate dark green leaves golden on the back and very finely nerved, and by the gutta which is produced from all parts.

The wood is light brown, the ground colour grey in section, the rays and concentric lines which are rather distant red, the pores

are large. This is rather a poor wood although it is nicely marked and of a good colour. Weight 35 lbs. 4 ozs.

Dichopsis obovata, Clarke. Belian Wangi.

This high class timber has been identified (Kew Bulletin) as that of *Dichopsis obovata*, a big tree with large obovate glabrous leaves. The timber is very dull reddish, grain medium very hard, splits slightly in drying, affords beams of excellent quality, which remain undecayed a long time under water and are not readily eaten by termites. A cubic foot weighs 64 lbs. $2\frac{3}{4}$ ozs. Bark smooth $\frac{1}{8}$th inch thick, wood greyish brown, rays very fine, rings distinct and irregular with very fine concentric rings numerous and wavy, pores moderate in short rows parallel with the rays, often subdivided, not very numerous.

D. bancana, Miq.

Is a gigantic tree with a straight stem about 80 feet to the first branch. It appears to be a good timber. The wood is reddish brown, rays fine and close, pores moderate in radial rows, rings fairly distinct, fibre wavy. A light wood with a good gloss.

Payena lucida, A Dec. Niato balam.

Is a common tree which attains a height of 100 feet. The wood is used for planking. It is hard and red with moderate sized pores in short radial lines, the rays very fine and numerous, the concentrics numerous wavy parallel. The weight per cubic foot is 45 lbs. according to Gamble, 29 lbs. 13 ozs. according to Maingay.

A timber obtained in Kwala Lumpor under the name of Niato may belong to this plant. It is heavy and of a dark brown colour with fairly large scattered pores and fine and distant rays, a good useful wood. Weight 40 lbs. 8 ozs.

Niato received from Singapore Sawmills much resembled a wood called Johor Teak, Balau No. 2, and Sundik. It is red with large pores arranged in short longitudinal rows parallel to the very close fine rays which are connected by short tranverse rays. It is a good wood for planking. Weight 30 lbs. 6 ozs.

P. Leerii, Gutah Sundik.

A fairly tall tree with ovate cuspidate dark green leaves. It attains the height of 80 or 90 feet and a diameter of $1\frac{1}{2}$. The wood is light brown fairly heavy and hard, pores few and scattered, rays fine but not very close, and the concentric lines wavy and broken up, a good hard wood. Weight 74 lbs. 12 ozs.

The tree is most valued for its gutta percha which is second to Getah Taban in value.

Mimusops Elengi, L. Poko Tanjong.

A tree often planted by roadsides etc. but doubtfully wild here. It attains no great size, usually about 20 feet tall and $1\frac{1}{2}$ foot through.

The wood is light red and hard, does not split in drying, is fine grained with obscure rings, the pores medium in size arranged in

rows, the rays are very fine mixed with some larger ones, and there are numerous small transverse bars.

It is used in India for carts, cabinet work and house building. Its weight averages from 41 lbs. (Maingay) to 60 (Gamble) S. 53 lbs. 13 ozs.

M. Kauki, L. San.

A medium sized tree cultivated at Malacca chiefly for its fruit. The wood is valued for Chinese coffins, but it is difficult to get large trees and it is not common.

Unidentified Sapotaceous timber are S'marum a wood much resembling Johore Niato but darker. It is used for planking. Weight 51 lbs. 3 ozs.

Daru.

A fairly large tree producing a hard and heavy wood somewhat resembling Balau. It is yellow in colour with numerous fine distant rays paler than the darker ground with large scattered pores. It has an aromatic odour when cut due to a resin. Weight 37 lbs. 4 ozs; a specimen from Lingga, 65 lbs. 14 ozs. HOWARD NEWTON, says that it could be got from 6 to 12 inches square and from 20 to 30 feet long. However the demand for it has been so great that it is with difficulty procurable now at anything like that size, although the tree has no sapwood, and is good all through. It seems to be a native of Sumatra chiefly, I have never seen it in the Peninsula, NEWTON gives it as of the genus apodytes, (*Olacineæ*) but this is an error it is certainly Sapotaceous.

EBENACEÆ.

More than one tree here produces ebony. (Kayu Arang) among which are *Diospyrus microphylla*, a big tree with small leaves, and *D. clavigera, Clarke,* a plant allied to the true Ebony of India *D. ebenum*. The ebony is only the heartwood of the tree, which contains a large amount of white or brown sapwood, so that a tree must be full grown before much ebony is to be obtained from it.

In *D. clavigera,* the sapwood is brown, the heartwood black and very hard and heavy, a cubic foot weighting 80 lbs. 15 ozs.

The pores are few small and scattered, sometimes divided, the rays are fine and numerous, and there are very many short transverse bars, giving the wood a very distinct appearance. Apart from the ebony heartwood this is a good and strong wood. Weight 51 lbs.

D. lucida, Wall and *D. microphylla,* have very similar wood rather darker coloured.

The ebony produced by these trees is very hard, though rather brittle, deep black and heavy, very compact so that the rays and pores are almost invisible. A sample from Malacca weighed 56 lbs. 4 ozs. and one from the sawmills of Johor 69 lbs. 12 ozs. Ebony is obtained in the Dindings, Johor, and Malacca.

Styraceæ.

A small order of trees and shrubs.

Symplocos fasciculata, Zoll.

A common small tree attaining a height of about twenty feet and a diameter of 1½ feet with grey bark. The wood is rather soft and white with very numerous pores and rather thick distant rays. Though by no means a first class wood it is suited for small work such as ornamental cabinet making, soft carvings, etc., and is also used in building.

Weight 28 lbs. 11 ozs. to 33 lbs.

The other species e. g. *S: ferruginea*, Roxb. very much resemble it in wood structure.

Styrax Benzoin, L. Gum Benjamin. Kemeniyan.

A tree about thirty to fifty feet tall with smooth grey bark, the leaves ovate lanceolate rather thin, light green above and white beneath. Flowers white very sweet-scented, fruit rounded hard greenish gray.

The wood is light brown moderately heavy but rather soft, the pores are rather large arranged in twos and threes, the rays in section are fine and red rather distant. Weight 34 lbs.

The wood of this tree is of little value, though it is occasionally used in house building and for bridges. The tree, however, produces the Penang Gum Benjamin which is much used in incense. The gum is obtained by making incisions in the bark, when after a few weeks the gum is exuded usually in a crystalline form. No gum exudes on first cutting the tree, nor have the bark or wood any odour of incense even when burnt. Gum Benjamin is not extensively collected in the Peninsula common as the tree is.

Apocynaceæ.

This group consists chiefly of creepers, with a few trees some of large size. All contain a milky latex often rich in rubber, among which of importance are the rubber vines, *Willughbeia*, *Leuconotis*, *Melodinus*, *Urceola* and *Parameria*, which supply the rubbers known as Getah Grip, Getah Susu and the like, in this country and the Landolphias of Africa.

Dyera costulata, Hook fil. Jelutong.

A big tree attaining a height of 200 feet and a diameter of 3 or more with grey bark, containing much milk like latex. Leaves, six to eight in a whorl.

The flowers are small and white. The fruit a large double pod, woody, which splits along the upper surface and discloses many thin flat seeds with a wing surrounding them.

The wood is white and soft with large pores rather few in number with fairly close rays. Weight 22 lbs. to 37 lbs.

It is used for making clogs, and also for planking, boxes etc., also for models and such work. It is fairly easy to work, but is soft and not very durable. However, it is coming more into favour, and may be considered as good as ordinary serayah for house work.

Jelutong pipit is a much harder wood and is less wooly to the saw than ordinary Jelutong. Weight 29 lbs. 6 ozs. to 36 lbs.

Alstonia scholaris, R. Br. Pulai.

A tall tree with grey bark and straight boughs at right angles to the trunk arranged in a whorl. The leaves are smaller than those of the Jelutong.

The flowers are green, the pods long and cylindrical, narrow, with plumed seeds.

The milky latex is only used for bird catching.

The wood is soft and white much like that of Jelutong but lighter, weight 20 lbs. 13 ozs. It is seldom used for anything, but the tree throws up knee shaped roots through the ground, which being very light are cut into as floats for nets. The bark known as Dita bark is bitter and is used as a tonic in India. It contains an alkaloid known as Ditaine.

A. angustifolia, Wall.

A medium sized tree, common in the Southern woods.

Wood pale brown fine grained rather light and soft, pores very numerous mediocre close, rays unequal some fairly large, concentric lines fine and close.

Supernæ montana corymbosa, Roxb. Restong Badak.

A tree 20 to 30 feet tall but often smaller. Has a soft white wood rather light with very fine broken up rays and very small pores.

LOGANIACEÆ.

The only important genus of timber trees is that of *Fagræa,* which contains a few fair sized to large trees besides some shrubs and climbers. The most important is—

Fagræa fragrans, Roxb., *Cyrtophyllum fragrans,* Bl , Tembusu.

A large tree attaining a height of 60 feet and a diameter of one to two feet with thick deeply grooved bark, narrow lanceolate leaves, and corymbs of rather small yellow flowers, followed by small red berries. It grows in open country often near the sea. The wood is yellowish white hard, compact and very durable, there is no sapwood, the wood being nearly as hard all through to the bark. The rings are fairly distinct and close, rays very fine, with concentrics close rather broad and pale, pores few. Weight 39 lbs., 43 lbs. 10 ozs., 63 lbs. 15 ozs.

The wood is very durable untouched by white-ants and fungus, and lasts long in the ground.

Its growth is fast considering the density of the wood. It is readily raised from seed, and grows well in open country, but is seldom to be met with in forest. In the sandy country in Pahang, Province Wellesley, Perak, Singapore, it grows well and of good size.

F. speciosa, Bl.

Tembusu bukit, Tembusu Tembaga Tembusu Talang and Tembusu Paya.

This is a very much larger tree than the preceding attaining a height of 80 feet or more, and a diameter of five feet. The bark is

very peculiar being deeply channelled longitudinally, and rather smooth along the ridges. The leaves resemble those of *F. fragrans*, but are more undulated. The flowers fewer and larger, the berries yellow. The stem is in large trees but little branched, forming a straight stout solid mass of timber, but in more open places it is apt to branch low down when young like *F. fragrans*. It is more of a forest tree than that species, and occurs in Singapore and Negri Sembilan and also in Sumatra. The wood resembles that of common Tembusu, but is more compact and resinous with a strong odour, and shows no concentric lines. Weight 34 lbs. 6 ozs. It is very durable. An old stump in the Botanic Gardens which must have been felled upwards of fifty years ago, and which bears on the top trees of Kumpas of considerable size has a considerable portion of the wood still perfectly sound, possessing when cut the resinous odour and the yellow colouring of fresh wood. The timber is very much valued on account of its durability and great size. It is used in building for house beams, bridges and planks.

F. Wallichiana, Benth.

A rather smaller tree though tall, and very different in appearance from the other species. It occurs on hills at about 2000 feet, especially in Penang. The wood is very heavy and darker in colour than the other kinds. A very fine compact wood. Weight 68 lbs.

F. fastigiata, Bl. Malebera Malbira.

This is a very different style of tree from any others of the group. It is of no great size, about 30 or 40 feet tall with few spreading branches, and very large ovate leaves with prominent veins. In habit it more resembles *Terminalia catappa* than anything else here. The flowers are flesh colour, an inch across, in large corymbs and the fruit is a greenish berry with minute seeds. The bark is rough and brown not very thick and young trees have thorny processes on the stems. It grows in damp swampy spots near tidal rivers from Johore to Penang. The wood is of a dirty yellowish colour with very close narrow rays, and scattered pores partitioned. Weight 41 lbs. 6 ozs.

It has a great reputation for resisting water, and if the trunks are used with the bark on resist the teredo, so that it is very valuable for wharfs and piles. It is of fairly rapid growth but is becoming scarce as the usual habitats are getting built over on otherwise occupied. It would be worth planting in such places as were not required for building etc. to supply piles etc.

Bignoniaceæ.

An order scantily represented in the East Indies.

Stereospremum chelonoides, Dc.

Tree about 60 feet tall, rather scarce in the Peninsula.

Wood fairly heavy, dirty white, rings well marked, pores in rows parallel to the rings fairly large, rays fine and close "Wood moderately durable elastic easy to work, it is used for building and is good for furniture, used for canvas in Assam and tea-boxes in

Cachar. (Gamble) growth moderate. Weight average about 47 lbs. (Gamble) S. 42 lbs. 3 ozs.

S. fimbriatum, Dc. "Chacha."

A fair sized tree, flowers tubular with a broad limb fimbriate at the edge, pink or white, 80 to 90 feet tall. Wood darker coloured, durable, used in building giving beams 5 to 8 inches square.

S. hyposticum, Miq. Lumpoyan.

A tree of no great size, 20 feet and a little more, common in the woods of the South.

Wood light coloured, rings obscure rays rather distant, pores moderately large, a poor wood. Weight 29 lbs. 4 ozs.; 34 lbs. 8 ozs.

Oroxylum indicum, Vent.

A tall slender little branched tree about 40 feet tall with bipinnate leaves, and racemes of dull purple flowers followed by long swordlike pods with thin flat winged seeds. It grows fast, and the wood is soft and white, or light fawn colour with fine rather distant rays, pores moderate sized scattered. A poor soft wood.

Weight (Gamble) 30 lbs.

VERBENACEÆ.

Callicarpa longifolia, Lam. Tampang Besih.

Shrub, with lilac flowers and white drupes, rarely attaining any great size.

Wood whitish brown soft and light, rays fine not close, pores small. Weight 43 lbs. 2 ozs.

C. arborea, Roxb. Ambon.

Attains a height of 50 or 60 feet, fairly thick in the stem and much branched above.

Wood white not heavy, floats in water, rings not very distinct, rays very fine, pores medium.

Used in house building but poor. Maingay gives it under the name Kapayang as reddish white streaked and blotched with reddish brown becoming darker towards the centre, fairly hard. Weight 46 lbs. 6 ozs.

Premna cordifolia, Roxb. Buas Buas.

Tree or large shrub, with strongly scented leaves, small white flowers and black drupes. A plant of rapid growth, growing readily from cuttings of any size, good for hedges. Wood yellowish white with fine parallel rays lighter coloured than the surrounding tissue, pores fairly large. Weight 32 lbs. 9 ozs.

P. divaricata, Wall. Buas Buas.

A climber, wood yellowish white grain medium or coarse fairly hard, splits in drying. Used for general work. Weight 49 lbs. ¼ ozs. (Maingay).

Vitex pubescens, Vahl. "Leban" tandok, Leban hitam, Halban.

A common tree in open country, about 40 feet tall, stem one to 2 feet through. Bark flaky light coloured.

Flowers small violet. Drupes black.

Wood yellowish white hard and heavy with distinct rings, rays fine and close.

It does not split in drying. Weight 51 lbs. 4 ozs. to 54 lbs. 6 ozs. (Maingay), according to Gamble from 51 lbs. to 59 lbs., S. 45 lbs. 11 ozs. to 49 lbs. 8 ozs.

A good useful wood for buildings, boats, ploughs, wagon wheels and such work.

V. vestita, Wall. "Leban nasi."

A medium or small tree with trifoliate leaves and small yellow flowers, common in woods, attains a height of 30 or more feet.

Wood light whitish fawn with distinct rings, rays fine and numerous, small pores. Weight 32 lbs. 10 ozs.

Used for building, for rafters and firewood, but very inferior to the preceding.

CLERODENDRON.

A small number of shrubs some hardly woody the only arboreous one is

C. disparifolium, Bl.

About 15 to 20 feet tall rather slender, flowers yellow, fruit black surrounded by the red calyx lobes. Wood white rather light rays, variable reddish pores, scattered. Too small to be of much use. It is one of the woods used by natives for blackening their teeth. Weight 35 lbs. 12 ozs.

Peronema canescens, Jack.

A large shrub or fairly large tree about 40 feet tall, with pinnate leaves, large panicles of white flowers. Usually to be met with along river banks and damp spots. Wood white light but fairly hard, rings distinct, rays distant rather fine, rings distinct marked with a close continuous line of pores. Pores large often partitioned few. Weight 30 lbs.

Used for house posts in Java (Van Eeden.) This tree is one of the few here which regularly sheds its leaves.

Gmelina villosa, Roxb. Bulangan.

A shrub treelet. Flowers large yellow. Open places near the sea wood brown light and soft, with rather large rays, rings visible but not distinct, pores mediocre to small often partitioned, arranged in small groups, of no use.

Avicennia officinalis, L. Api-Api.

A medium sized tree common in mangrove swamps with small yellow flowers.

The structure of the wood is very curious, it is of a light brown or grey colour rather hard and heavy, of concentric layers often broken up and rather large the inner portion dark coloured with fairly large pores, outer portion softer and lighter with larger pores in rows, rays very fine and close. Weight (Gamble) 58 lbs., S. 51 lbs. 3 ozs. Only used here for firewood as its name implies, and

even for that purpose only when *Rhizophora* and *Bruguiera* cannot be got. Many mangroves near towns consist almost exclusively of this tree, the other kinds having been exterminated.

The teak, *Tectona grandis*, L. Jati.

Has been largely experimented with here and proves a complete failure. It grows to the height of some 12 or 15 feet and then dies down, throwing up another shoot which behaves in like manner. One or two trees in the Botanic Gardens have attained a height of about 40 feet and produce flowers and fruits but these are exceptions. Possibly it might do better at a greater altitude, but it is certainly useless in the low country.

NOTES ON GUTTA PERCHA TREES

BY C. CURTIS.

Owing mainly to the fact that the two substances, Gutta Percha and india-rubber, are both quoted in the Straits market reports and known locally as guttas, which is literally following the Malay names, much confusion exists in the minds of the general public, and of some planters, as to the difference in the properties and uses of the two substances, as well as to the trees that produce them. The most conspicuous property of gutta percha, and the one that distinguishes it from rubber, is its capability of becoming soft and plastic on immersion in hot water, and retaining any shape then given it upon cooling; when it again becomes hard but not brittle. Rubbers, on the other hand do not soften in hot and retain their original elasticity. According to Dr. OSBACH, whose Cantor lectures on the subject is a classical work, the earliest intimation of the existance of gutta percha was about the middle of the 17th Century at which time there appears to have been a specimen in Tradascants Museum known as the "plyable mazer wood, which being warmed in water will work to any shape". This is considered to apply to gutta percha since no other substance suitable for Mazers or goblets is known to possess this remarkable property. From this time until the year 1843 nothing more appears to have been known regarding this wonderful substance when it attracted the attention of two residents in Singapore both of whom sent specimens to Europe. At a meeting of the Society of Arts held in January 1845 these specimens, which consisted of a riding whip and a lump of gutta, came under the notice of Mr. (afterwards Sir) WILLIAM SIEMENS the ultimate result of which was its adoption for insulating telegraph wires and other electrical work, which created a demand that has practically exhausted the forests of this region of large gutta producing trees. All genuine gutta percha is obtained in the Malayan Archipelago, and the area within which it is found growing extends about six degrees on either side of the equator. They do not occur so far north as the Langkawi, Islands, and the so called guttas from there and the Mergui Archipelago are I believe mainly obtained from species

of Ficus and Bassia. A plant brought from Mergui, and said to be one from which gutta is obtained there, is now growing in the Penang Garden, and is undoubtedly a Ficus, but too young for specific determination. What is collected in the Langkawi Islands and known as "gutta minjato" is obtained from a species of Bassia of which better material is needed before it can be correctly determined. For some time it was supposed that gutta percha was obtained from one tree only which has been described under the three generic names of Isonandra, Dichopsis, and Palaquim. This does not as some persons think represent any doubt or confusion as regards this particular tree, and the explanation is simple. It was orginally described as an Isonandra and subsequently found not to agree in certain characters with that genus; consequently a new genus, Dichopsis, was created. Later it was fouud that the characters of Dichopsis were identically those of Palaquim which, being of older date, takes precedence according to botanical etiquette. We now know that there are several species of Palaquim that yield good gutta percha, though perhaps none of them are equal to P. gutta and P. oblongifolium; the latter being considered by some botanists as merely a variety of the former; but much remains to be done in the matter of determining the species and varieties of this genus, and adequate material in the form of flowers and fruits are rarely obtainable. In the Waterfall Valley, Penang, there are two trees growing side by side and which until they fruited last year were thought to be both the same kind. One has rounder and deeper coloured fruits than the other and is now thought to be an undescribed species, the other being the true Palaquim gutta; but whether the distinction is sufficient to warrant its being considered anything more than a variety of Palaquim gutta I am extremely doubtful. An analysis of the gutta gives almost exactly the same result, both being of a very high class. Gutta Sundek, which is a Payena and not a Palaquim, also yields good gutta percha. The inferior kinds are mostly obtained from trees belonging to the same order (Sapotaceæ) as Palaquim gutta; P, obovata being one, which is known in Malacca as "Niato Bunga" and "Niato Balam." Some of the Bassias, and as already mentioned, one or more Ficus, produce an inferior article. Malay names for gutta percha trees vary in different localities and as a means of identifying species are unreliable. As a guide to the identification of genera and Natural Orders, however, they are sometimes helpful and I have not found that they apply the name "taban" to other than species of Palaquium; although at Indrageri in Sumatra where the name for Palaquium is Balam, and not "taban", Payena Leerii is known as "Balam Sundek". Palaquium gutta is generally known as "Taban merah" in the peninsula, "balam merah" in Sumatra, and "Ekor" or "Ekor dhaun durian" in Penang Other species or varieties of Palaquium, having somewhat similar leaves, are "taban sutra", "Taban putih", "taban chair", and "taban etam" (S. Ujong). "Balam putih" in Sumatra is not the same species as taban putih in Perak. Reliable information as to the rate of growth and amount of gutta to be obtained from

trees of a given age is almost entirely wanting. Large trees old enough to produce seeds are exceeding difficult to find, and the largest I know of are those in Penang which fruited last year. The largest of these is 56 in. in circumference at five feet from the ground, but there are several others that measure between forty and fifty inches; and are 50-70 feet high. Compared to most other trees Palaquiums are slow growers and of 1,000 young plants, two years old from seeds, the tallest is not more than two feet high; and at Kwala Kangsar there is a tree which is known to have been planted eighteen years ago the height of which is twenty-five feet and the circumference at three feet from the ground 24 in. In the Encyclopædia Britannica it is stated that the yield of a tree 30 years old and 30-40 feet. high is from 2 3 lbs., and that a full grown tree sometimes measures 100-140 feet. to its first branch with a circumference of 20 feet. at fourteen feet from the ground and may yield 50-60 lbs. of gutta. In order to obtain some definite information on this point a tree measuring 39 inches in circumference at 5 feet. from the ground and 55 feet. high with a clean stem to a height of 35 feet., at which point it had a circumference of 28 in. was cut down in Penang in November 1900 and the gutta collected under my personal supervision, and the result was 1½ lbs., of gutta percha. The annual rings showed that this tree was over 50 years old. What the age of a tree 20 feet in circumference at 14 feet from the ground would be can be inferred from this, but it is doubtful whether any such tree at present exsists. A second experiment made in 1901 on a tree that was blown down in the Forest reserve Penang which was 52 feet high and 42 inches in circumference at the same height from the ground yielded one and one third of a pound only. Palaquium trees are found growing from sea level up to close on 3,000 feet, generally in damp ravines and not far from streams; often among masses of boulders in places where there is little soil but abundant moisture. Attempts at cultivation were made in Singapore as early as 1848, when no less than seven plantations were started there, but one by one they were abandoned and it is doubtful whether a single tree now remains to mark the spot. Quite recently attempts have again been made by private owners in Sumatra and Johore, both of which I have seen. The former was commenced about four years ago and a good number of trees are growing, but in the latter which started later practically none remain. There is little doubt that in the earlier stages of growth partial shade is necessary, and that failure in the past was largely due to the attempt to form plantations in the open with full exposure to the sun; but in any case, and under the most favourable conditions, the rate of growth is too slow to make the cultivation, a profitable business for private individuals. The extraction of gutta from the leaves is now practicable, but it has yet to be proved to what extent the trees will stand plucking and the quantity to be obtained. From information received I believe that most if not all of the leaves that have been brought into the market from Borneo and Sumatra are from trees that have been cut down in the

usual way to obtain the gutta from the stem, but even this is an improvement for formally all the gutta in the leaves was wasted. Whether the leaves from a tree that has been cut down contains more gutta than those plucked from the tree while still growing is another point requiring testing, for the Malay gutta collectors always hasten to lop the branches off as soon as the tree is felled their idea being that if this is not done little gutta will be obtained from the stem as it all runs into the leaves. In the absence of seeds, which is the best of all methods of propagation, I have seen but one way in which these trees can be produced in large numbers for forming plantations, and this depends on the possibility of getting a sufficient supply of young saplings to work on. Of all other forms of cuttings which we have tried the successes have not averaged one per cent. The method I refer to was briefly discribed in No. 2 of this Bulletin in "Elementary Notes on the Propagation of Plants" and consists in laying down small saplings the size of a lead pencil in a horizontal position until they have made shoots 3-4 inches long at right angles to the stem, the latter being then cut clean through on either side of the shoot at about an inch or an inch and a half distant, and planted rather deeply in beds or boxes in clayey soil and kept cool and damp until rooted. By this method plants a foot high can be produced in about a year and a half when they are ready for planting. In regard to forming plantation there is little or no information available, as no one has had much experience in the matter, but so far as my own observations go I am of opinion that partial shade is absolutely necessary in the earlier stages of growth, the amount to be reduced gradually as the trees acquire age.

"WHITE ANTS AND RUBBER."

By E. V. Carey.

In the successful cultivation of Para Rubber. (*Hevea Braziliensis*), Rembong (*Ficus Elastica*), and coconuts, there is certainly no factor which demands closer attention on the part of the planter than the extermination of the *Termes gestroi*. Perhaps I should scarcely use the word "extermination," because to entirely destroy and rid an estate of these pernicious insects is an obvious impossibility, inasmuch as they devour both growing and dead wood with seemingly equal impartiality, their presence being only revealed when living trees are the temporary object of their attention.

Upon this subject you, Sir, have already written, Mr. W. W. Bailey has contributed a long and interesting article, and Mr. Pears of Muar has also had something to say; I should like now to give you the result of my own personal observation in the hope that a little additional grist to the mill may help to sustain the interest in this important question, which the articles before referred to have certainly awakened.

As early as 1893-94, I began to lose an enormous number of coffee trees from the attacks of what everyone then called "white ants." No remedies were apparently of any avail, though with some, notably "London purple," I succeeded in killing the tree a trifle sooner than the white ant did, and at last I came to the conclusion that the thing to do was if possible to destroy the queens, accordingly I offered a substantial reward for each queen brought to my Bungalow; this was the beginning of my experience of "digging," numbers of coolies turned out every evening, attacked the mounds of which there were thousands every where and my original reward dropped with leaps and bounds as the queens began to come in, until even at 5 cents each the amount paid out became a very considerable item in my monthly expenditure. To my great disappointment, however, there was no decrease at all in the attacks upon my coffee, and, puzzled by this, I sent specimens to Mr. E. E. Green, a personal friend of mine and now, the Ceylon Government Entomologist. In due course I received the pleasing intimation that whilst the collection of queens, of which I had stated myself possessed, was exceedingly interesting as a monument of energy on the part of my coolies, its practical value was nil, inasmuch as it was clear from the specimens which I had forwarded that I was waging war against *the wrong species*! This opinion having been confirmed by Mr. Ridley who identified the insects which were doing all the damage as *termes gestroi*, the queen of which he told me had been very seldom found, I gave up digging, and confined myself to cleaning the ants off the stems as far as possible and destroying what I could see, which did a certain amount of good, but not very much, as they often ate right up the centre of the tree and were not visible from the outside. In those days we had not commenced planting rubber, and coffee never having been very severely attacked on any other estates, not much attention was paid to the matter, when, however, our Para, Rembong and coconuts trees, in the "Ulu" and the coast districts alike, began to suffer from the ravages of these pests, every conceivable remedy was tried and persisted with. Roots were bared and kept open to the air, painted with tar, washed with Bordeaux mixture solutions of tuba root, vasamboo (sweet flag), jey's disenfectant, etc., in the case of coconuts large quantities of salt were dug in close round the base of the tree, clumps of cuscus grass were planted close up against the stems of the rubber trees, and everything tried which seemed to offer the smallest chance of success. I have calculated that where effected trees could be treated every second or third day, the actual mortality was, with the assistance of these remedies, kept down to about 5 % to 6 % of the trees actually attacked, but the expense was of course very heavy, as the same tree had to be attended to times without number before the termites moved on. Then came Mr. BAYLEY'S wonderful effort upon Lowlands where more damage was being done than on any Estate in Selangor; judging that a thorough digging all over would be of great benefit to his coffee and would at the same time, probably,

disorganised the termites, he conducted his crusade, against, undoubtedly, the worst enemy the planter has at present, with unqualified success, and to him must belong the credit of having put us all on to the right track, of course it is not every proprietor who can afford to dig over the whole of his estate at an expenditure of $3 an acre which is the minimum cost of such work if thoroughly done, nor do I think such a procedure at all necessary unless the place is riddled from end to end or "cultivation" is aimed at as well as the destruction of the termites. It will be quite sufficient if starting from the attacked tree, the ground is dug right down on the alluvial to water level, *i. e.* 2½ to 3 feet, or on high land as far as the termites are found to go, and for a distance of not less than ten feet in every direction; outside this distance the line of the ants should be followed, if possible, up to the nest and the queen destroyed. If this treatment is thoroughly carried out it will not require to be repeated, or at any rate, not until an entirely fresh attack takes place; I have tried it over and over again now and have so far never had a tree attacked a second time. I even go so far as to say that if the ants *do* reappear within say 3 days, the Superintendent should make the coolie do the digging over again without any pay as a punishment for bad work. This may appear a strong statement, and rather hard on the coolie, but when it is considered that termites work in bodies from a common centre, the nest of their queen, it is obvious that the breaking up of their lines of communication is a blow to them, which, even though the destruction of the colony be incomplete, must at any rate, constitute a check from which it will take them long to recover, for it may, I think, safely be said, that not one in a thousand termites that have been cut off from their "way home", ever find it again, as directly they are exposed on the surface countless numbers of black and red ants fall on them and carry them off; the ants remaining in the undestroyed nest (which by the way is almost always found in a log or the stump of an old tree) in course of time they will no doubt reorganize and return to the attack, but it will take them a very long time to get back to the same tree a *second* time. Regarding the fungus theory I must confess that I do not think the *termes gestroi* is specially attracted to a tree because it has been rendered moribund by fungus, for I have seen thousands of both coffee and rubber trees covered with *gestroi* and yet without a trace of fungus about the roots or base of stem. It is a common thing, however, to see rubber, and indeed any other trees which have been killed by fungus simply riddled with *Termes bellicosus*, but these termites I have never known to attack a living tree, unless in quest of a dead branch or decayed knot in the stem, and then they do little or no damage, simply tunnelling up on the outside, without feeding on the tree at all until they reach their objective. As far as I have been able to observe, *Termes gestroi* make no mounds at all and their queens are always found in a nest of soft fibrous material and not in hard clay cones such as those in which the common *bellicosus* queens are encased. Mr. PEAR'S experience that *Ficus elaitsca* does better when plant-

ed on ant heaps than in the ground itself is interesting, perhaps there is some particular virtue in earth so worked up? but the more likely reasons appear to me to be either that the surrounding ground is insufficiently drained, for *Ficus elastica* is exceedingly impatient of wet when young, or that being naturally an epiphyte the higher it is off the ground the more air it gets and consequently the better it comes on.

COCO-NUTS.

The present price of coco-nuts $33 per 1,000 and the recent very high price $37 must be very encouraging to those planters who do not put all their eggs into one basket; and who are content with fair returns on their capital. While fortunately it is true that, there is little probability of other crops like Rubber exceeding the demand for some considerable time to come, and consequently Planters suffering a great drop in prices. Still, those Planters who have judiciously planted up parts of their Estates with Coconuts may rests assured, that, although they will not make rapid fortunes, have nevertheless a staple crop which may reasonably be expected to yield a steady return, and so to a great extent eliminate that worry which the speculative element connected with planting crops which are sometimes, liable to rapid fluctuations in price entail. Perhaps no plant in the vegetable kingdom, has so much literature in connection with its history, growth, and uses as the Coco-nut Palm, nor probably is there any other single plant which so richly deserves to be written about. It is scarcely an exaggeration to say that it has as many uses as there are days in the year, certainly there is no part of the plant but what is useful for some purpose or another. I do not propose to enumerate the uses, nor to say much about its cultivation here, as these matters have been gone into so fully in such works as Watt's Dictionary of Economic Products, Ferguson's Coco-nut Planting etc. For the information of those Planters, however, who are contemplating planting coco-nuts and have not access to the books I have mentioned I may say that the first thing to be considered is selection of site. Now while the coco-nut is a truly littoral plant, and thrives best in the vicinity of the sea, it is a mistake, as some suppose that it will not grow away from the sea, and so far as the Malay States are concerned this point need not trouble intending planters. The second point for consideration would be soil, and the answer to this would be a fine loamy soil, which if slightly inclined to be sandy, so much the better. The soil at Klang appears to suit them admirably as the accompanying figures show. Fig. I shews a four year old tree come April, and I think it would be hard to shew a finer tree at the age, the comparative height is shewn by the manager standing close by. Fig. II from the same Estate is if anything even a more promising specimen of robust vigour.

For the rest it need only be said that coco-nuts begin bearing in from seven to ten years, and should produce when in full bearing anything from 50 nuts and upwards annually, and go on bearing

B. Rajah Estate.
Cocoanuts planted, April 1898.

for generations, with the application of a dressing of manure now and then. About 25 feet apart, giving seventy trees to the acre is considered the best distance to plant. Mr. C. CURTIS writing from Penang says "Coco-nuts in Penang and Province Wellesley are "selling well, the demand being greater than the supply. Al-"though local papers here for some time past have quoted the "price as being $28 per 1,000 f.o.b., it is long since they have ac-"tually sold for this price. Forward sales for next plucking have "been made at $31 per 1000, delivery to be taken on the spot. "This high price is apparently due to a shortness in the crop in-"duced by the prolonged drought at the begining of 1901."

Some interesting remarks on Coco-nuts in Selangor are communicated by Mr. E. V. CAREY in the present issue.

COCO-NUTS IN SOUTH AMERICA.

An interesting report regarding the production of coco-nuts in South America was recently issued by the Consular Department at the city of Washington, U. S. A.

The countries dealt with were Brazil, Colombia, Ecuador, the Guianas, Peru, and Venezuela. And the report was based on information received through the consuls at the places mentioned.

COCO-NUTS IN BRAZIL.

Although a great many coco-nuts are raised in the Bahia consular district of Brazil, it does not produce one-third as many as the Pernambuco district, which is particularly rich in coco-nut palms, on account of its peculiar coast formation.

In the Bahia district, the trees are found wherever there is a settlement, but grow chiefly on the strip of low-lying sandy land along the coast. This land is the most desirable for coco-nut plantations, as the proximity of the salt water makes the trees more productive and the fruit a better quality. Occasionally a piece of land is found at a considerable distance from the coast upon which the palms will flourish, but this is unusual. Single trees are scattered here and there inland; but these are raised with considerable difficulty, produce only an indifferent fruit, and die at an early age.

The number of trees and their productiveness increases as the Pernambuco district is neared and decreases in the same ratio Southward. The largest plantations are a short distance north of Bahia City, where there is one that has more than 7,000 and several which have as many as 5,000 trees each; but no particular efforts at cultivation are made. The coco-nuts have simply been planted and allowed to come up and produce what they will, the fruit being gathered from time to time. The owners are usually engaged in other businesses; the proprietor of the large plantation above mentioned, for instance, is a local merchant.

It is impossible to get any information as to the extent of the coco-nut crop. The nuts are gathered in all seasons and are used both in the green or soft and in the ripe or hard state by all classes. The yield, however, must be enormous, as there are few house-

holds that do not use the nuts in some form or other, and in spite of the vast number of trees, the supply does not seem to equal the demand.

Before the shell of the nut becomes thick and hard and while the meat is soft and about the consistency of clabber, many of the nuts are gathered and sold upon the street corners and in the drink shops. The nuts are cut open with a machete. The milk proves a most refreshing drink, while the meat is eaten with a spoon or, more often, with a sliver cut from the shell. No attempt is made to husk the nuts so used, though frequently a portion of the husk is trimmed off to lessen weight for transportation.

The hard-shelled or ripe nuts have various uses. When of good quality, they are sold at retail. Many kind of sweet-meats are also made from them, while the milk and the meat, variously prepared, are constituent parts of many articles of daily diet, such as fish stews, beans, rice, corn, etc. The ripe nuts are always sent to market husked. They are brought to Bahia by small sailboats, which ply up and down the coast, and on account of the demand are sold at comparatively high prices. The price paid for them at the plantations ranges from 9 to 14 milreis ($2.18 to $3.36) per hundred (without respect to size,) according to seasons, the wholesale price in Bahia City being a couple of milreis higher per hundred. The retail price is from 120 to 320 reis (2.88 to 7.61 cents) per nut, according to size and season.

There is such a demand for good nuts at Rio de Janeiro and other points south that it is far more profitable to ship the nuts there than to utilize them in the manufacture of copra; and even if the prices at local markets were not so good, there would, nevertheless, be no nuts for foreign export.

It is only the nuts that have been left too long on the trees that are utilized in the manufacture of by-products. From these nuts the oil is crudely extracted by grinding the meat, submitting it to pressure and purifying the resulting liquid, or by grinding and boiling the meat, and skimming the oil. This oil is used for machinery, lamps, cooking, soap-making, etc. It is also used by the resident Africans for hair oil and for anointing the body. It sells at wholesale at the place of manufacture at from 800 to 1,200 reis (19.2 to 28.8 dollars cents) per litre.

There is still a great amount of uncultivated land well suited for coco-nut plantations. Few trees are being planted, yet it requires no labour other than that of putting a mature nut into the ground prior to the rainy season, and that after five or six years the trees will bear almost indefinitely.

Coco-nuts in Colombia.

The consul at Cartagena, Colombia, was placed at a disadvantage in gathering data for his report on account of the revolution in that country. Under ordinary conditions, writes the Consul, raising of coco-nuts is an interest of considerable magnitude, and a fair amount of attention is bestowed upon the groves and the collection, husking, sorting, and packing of the nuts. It may be said that,

with rice, the coco-nut is the main source of food supply of the natives of the coast.

Owing to the above mentioned conditions, the extent of the coco-nut crop of this district is unknown. Coco-nuts are grown both for home consumption and export. They are not shipped in the husk. The price at the present time is from $12 to $14 gold per thousand.

Coco-nut plantation in the Colon district of Colombia, are confined to a strip of land contiguous to the Atlantic Coast, and to the Island of San Andres, belonging to Colombia, lying about 275 miles from Colon in a north-westerly direction. There are no plantations in the interior. On the coast, by far the greater proportion of coco-nuts is raised by the San Blas Indians, on a strip of country about 125 miles long, extending from Point San Blas to Point Tiburon. Besides the plantations owned by these Indians, there is only one other on the coast, the Caribbean Coco-nut Plantation, at Point Toro, across the bay from Colon. This plantation consists of about 20,000 trees.

The entire coco-nut crop of the coast amounts to about 4,000,000 nuts a year; that of the Island of San Andres to about 2,500,000.

Cocoanut trees are raised by first putting the dry nut on the ground and allowing it to sprout until it attains a height of about two feet. The nut is then put in a hole just deep enough to receive it the sprout remaining above ground. The only attention the palm requires is to keep it free from weeds and other plants until it is five or six years old. After this age it is able to protect itself, and the ground requires very little cleaning. Trees properly attended to will bear in from five to six years.

All nuts raised in this district are sent to the United States. They are never shipped in husks. The market price fluctuates between $21 and $40 per thousand. From March to September, it rarely reaches more than $25; from September to March, $25 to $40.

Coco-nuts in Ecuador.

The cultivation of coco-nuts receives very little attention in Ecuador, most of the palms being grown as side issues upon the various estates. The few raised are for local consumption only; none are shipped. The price is 10 cents. silver (4½ cts. in United States currency) per nut, retail.

Coco-nuts in The Guianas.

The coco-nut crop of British Guiana amounts to about 5,000,000 nuts annually. The cultivation of cocoa-nuts receives considerable attention in the district of Mahaicony, about 30 miles up the East coast from Georgetown, in the vicinity of the Decerara and Berbice Railway. The nuts are mostly made into oil at the Oil and Fibre Mill at Mahaicony, and the product is sold consumed in the colony. Less than 2,000 husked nuts were exported last year. These were shipped to the British West India Islands.

The prevailing price in the local market is from $8 to $10 per 1,000.

Only about 500,000 nuts per annum are produced in Dutch Guiana, and an insignificant number in French Guiana. These are consumed locally.

Coco-nuts in Venezuela.

At La Guayra, the annual crop of coco-nuts amounts to about 1,000,000. At Barcelona and Comana, however, it is much larger: the latter could easily furnish 5,000,000 nuts a year. The cultivation of coco-nuts receives very little attention in La Guayra, and practically no efforts are made to extend their growth. There is no reason, however, why the present area should not be increased, as the palm thrives wonderfully along the coast, and nearly all of the land within half a mile or a mile of the sea could be furtilized.

The nuts grown in La Guayra district are mostly absorbed by the local retail trade of the cities of La Guayra and Caracas, a great many being sold to the natives, who drink the milk. The nut is also used for cooking, confectionery, etc. In Cumana, most of the crop is manufactured into oil. This oil is said to be of an excellent quality. A few nuts are occasionally shipped from La Guayra to the United States, but the trade is not profitable. The harbour dues on all kinds of freight is $4 a ton, and planters find that it pays them better to hold the nuts for local consumption. Coco-nuts are never shipped in the husk.

In La Guayra the price of coco-nuts is from $2.50 to $5 gold per hundred; in Cumana, from $2 to $3.

The production of coco-nuts in the Puerto Cabello district of Venezuela is limited, as there are but few trees. Very little attention is paid to their cultivation and the supply is decreasing. The soil, however, is excellent for the growth of this palm.

The nuts are marketed here green for the coco-nut water they contain; ripe, for the meat, from which oil for soap-making and other purposes is extracted, and as copra, for foreign shipment. The green coco-nuts are sold for 1 cent. each, ripe ones at about the same price, and copra for about 2½ cents per pound.

A NEW INSTRUMENT FOR TAPPING RUBBER TREES.

The "Teysmannia" and the "Indischen Merkur" give a description of a new instrument for tapping rubber trees, invented by Mr. H. C Praasterink of Toeder in Dutch India. This instrument is highly recommended, and has the shape of a hollow stem (iron) of 2.5 centimetres breadth. In the middle of the iron there is an oval opening, and on each side, just above the opening, there is a small tag fixed underneath, on which an earthen vessel can be hung up. The way of using the instrument is very simple. With aid of a wooden hammer it is knocked into the tree in a slanting direction, and if some small pieces of the bark should happen to fall into the instrument, these can be easily removed by blowing them off. The vessel is hung upon the two tags and the latex

flows into it through the opening in the iron. If the latex should occasionally run over the margin of the instrument, this does not matter, as it finds its way into the vessel. About 5 to 8 centimetres above the incision, one makes a few more incisions into the tree with a sharp knife. The latex runs then along the bark into the canal-like instrument and through the opening into the vessel. If several of these instruments are affixed on the tree, the collecting of the latex is a very quick process and one workman can tap several trees. After the latex has ceased to run, the instrument can easily be pulled out of the tree. By this process nothing gets lost when collecting the latex, and the latex itself is free from foreign matter. A few days later the latex coagulates in the shape of flat cakes, which can be easily taken out of the vessel. The wounds caused to the tree by this instrument close at the end of the second week after, and those made by the knife after a few days. The capability of the tree is in no way affected by this method.

ECONOMIC PRODUCTS.

THE RUBBER MARKET, 1901.

The correspondent of the Times of Ceylon, writing from London 10th January, says: Although there have been fewer fluctuations in price in 1901 than in previous years, at the close all rubber is cheaper than a year ago, Para showing a fall of 3*d*. The supply of medium rubber has fallen off greatly, and nearly the whole of the old stock has been disposed of at very low prices. Stocks of these kinds are now greatly reduced, and an improvement in values is looked for shortly. The year has shown a continued increase in demand for the finer rubbers at relatively high prices, and the European consumption of finer Para considerably exceeds any previous year. English manufacturers have been very busy; Continental fairly so. American were less occupied till the last three months, but on the whole the year has been a very active one. In supplies there has been a further increase from Brazil. From central America the supply has very considerably declined, and again owing to war there have been only small lots from Columbia. From Honduras, Mexico, and Panama very little has come. African shows a serious falling off, probably 1,500 tons, though the Congo has sent slightly more. As regards Ceylon, Messrs. S. FIGGIS & Co., to whom I am indebted for most of these particulars, have the following:—Of Ceylon small lots sold at high prices. We again urge planters to give attention to this valuable product. Ceylon is much liked and sells readily. We obtained 3*s*. 9¾*d*. recently for fine and 2*s*. 4½*d*. for negrohead grown from Para seed.

Indian Gardening and Planting, February 6th, 1902.

PRODUCE NOTES.

"INDIAN SENNA."

A large consignment of leaves was recently placed on the London drug-market under the same of "Indian Senna." Very few of the

leaves are perfect, as they are extremely brittle and readily broken. In shape and general appearance they are very similar to those of some of the species of Cassia, the leaflets being sessile, close, membranous obtuse, and varying from ½ inch to 1 inch or more in length. It is difficult to determine with certainty their botanical origin, but they agree very nearly with the leaves of Caesalpinia pulcherrima, a shrub or small tree universally cultivated throughout India and elsewhere in the tropics. The native country of this plant is not clearly known, but according to some athorities it was introduced into the Botanic Gardens, Calcutta, in 1792. All parts of the plant are said to be emmenagogue and purgative, but there appears to be no trustworthy data bearing upon this point. In India the leaves, flowers, and trees are employed in native medicine, and an ink is made from the charred wood.

CARDAMOMS IN FRENCH INDO-CHINA.

The *Revue des Cultures Coloniales,* of November 5th, in the course of a long article on the cardamoms of French Indo-China, states that the exports to Singapore and Hong-kong may be considered as representing the total production of the country, the quantity consumed locally being insignificant. Nearly the whole of the crop is sent to China *viâ* Hong-kong. It is the Chinese, moreover in Cambodia, Laos, Annam, and Tonkin who buy or exchange the cardamoms with the producers, and then send them to the different ports whence they are exported. This trade is said to be entirely in their hands. The port of shipment for Cambodia and a part of Laos is Saigon, with Cholon as *entrepot,* and market. The exports from Annam and the region round Laos go *viâ*. Vinh, and from Tonkin *viâ,* Haiphong. This latter port also receives many cardamoms from Annam. The following table shows the quantity and value of the exports of cardamoms from French Indo-China during the last two years :—

	1899.		*1900.*	
	Quantity.	Value.	Quantity.	Value.
	Kilos.	Francs.	Kilos.	Francs.
Annam ...	14,503	67,968	9,857	74,913
Cochin China and Cambodia	289,074	1,195,002	196,908	632,679
Tonkin ...	43,127	97,036	54,019	405,142
Total ...	346,704	1,360,006	260,784	1,112,734
	763,000 lbs.	54,000 £.	574,000 lbs.	45,000 £.

CORRESPONDENCE.

To The Editor, *Klang, 19-1-02.*

AGRICULTURAL BULLETIN, SINGAPORE.

By this post I am sending you samples of *Termes gestroi,* queens in spirits, and also of another termite, which is neither *gestroi* nor

bellicosus. The latter I have in large numbers amongst the roots of my *Ficus elastica,* you will find two queens, several winged insects (the wings very much in embryo at present) soldiers and workers. Can you identify these? and tell me if they are known to do any damage to living trees? so far, I do not think that I have suffered from them, but their numbers rather alarm me.

I am, Sir,
Yours faithfully,
E. V. CAREY.

P. S.—Has it ever been recorded that Para Rubber trees are rarely attacked by termites until they are 2 years old?, and that when 5 years and upwards they seen to have grown too hard and sturdy for the termites to damage them to anything like the same degree as when they are younger?

KLANG, SELANGOR,
15th February, 1902.

The Editor,
AGRICULTURAL BULLETIN,

Dear Sir,

Coco-nuts are now being so much planted on the coast district Estates that the following figures of the yield from a small native holding, estimated age 10-12 years, will, I think be of interest to many of your readers. This little patch of coco-nuts in the property of the Klanang Produce Coy: Ltd., and now forms a portion of the Klanang Estate, Jugra, of which Mr. W. GREIG is Superintendent. It was purchased from a Malay man by the present owners to secure a piece of road frontage, and was in a disgraceful condition when taken over, being grown up and choked with lalang, all sorts of undergrowth and weeds, besides having a number of fruit trees of various kinds in bearing growing under the coco-nuts all of these things have no doubt impoverished the soil to no small degree, and nothing in the shape of manure has ever been applied. In addition, the coco-nuts were regularly tapped by the former owner for toddy; yet in 1901, 136 trees, of which 6 were supplies not yet in bearing and 12 trees with only 3 to 4 and not exceeding 5 nuts each, yielded exactly 7,000 nuts or an average of 59·3 nuts per tree for 118 bearing trees, or 51·5 for the whole 136 trees. No one looking at this little patch, would say that it was exceptionally fine, yet the yield, I think it must be admitted, leaves little under the circumstances, to be desired. The soil I may mention is stiffish clay which, however, does not bake but disintegrates and crumbles when exposed to the sun, and is apparently identical with the rest of the alluvial all round our coasts. It has been said by high authorities that though coco-nuts may promise well during the first few years of their life on such soil, they will never give really satisfactory returns, but I think instances like that which I have quoted, show this to be a fallacy, and

with careful cultivation regular weeding and protection from insect pests, such as beetles and termites, we should get in my opinion an average yield of at least 60 nuts per tree. There are so many men who ridicule such returns that I hope some of them will come forward and let us have the other side of the question, of course it may be said that no one is justified in basing returns over a large Estate, from the yield of a few trees, and this I fully recognise, at the same time I show that the small holding, the yield of which I have quoted as what coco-nuts are giving, has 13% of practically unproductive trees, which would certainly be considered a very large average on a properly cultivated Estate.

I am Dear Sir,

Yours Faithfully,

E. V. CAREY.

E. V. CAREY Esqr.,

Dear Sir,

I yesterday received your Circular *re* agricultural Bulletin dated 20th January, 1902.

I agree with you that the Bulletin may prove to be a great source of information to all Planters, and that we should all do our best to contribute any information that would be of interest to others.

Some men may be too shy to write thinking that others can describe things better and so on; but what we want is an opinion from every Planter on any subject that he has the opportunity of experimenting on and I feel certain that all can express themselves sufficiently to give information that will be acceptable to all of us.

You ask for information with regard to yields and I think the following will be of interest.

The last two months has been the busiest time ever experienced on Lowlands Estate in picking and the return per acre has been as follows on the last few fields picked :—

4. A	=	13¾	Acres	=	2·34	Clean	Coffee per	Acre.
5. A	=	11½	,,	=	2·16	,,	,,	,,
6. A	=	9¾	,,	=	2·70	,,	,,	,,
7. A	=	7¾	,,	=	2·53	,,	,,	,,
8. B	=	21	,,	=	2·84	,,	,,	,,
9. B	=	16½	,,	=	3·00	,,	,,	,,
7. B	=	15	,,	=	3·02	,,	,,	,,

and I expect to average 2½ pls,, clean coffee per acre for the round of 500 acres.

Yours faithfully,

W. W. BAILY.

SINGAPORE MARKET REPORT.

January, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	33.00	33.00
Bali	7	28.00	27.50
Liberian	224	22.00	19.50
Copra	2,837	10.80	9.00
Gambier	3,344	13.25	10.62½
Cube Gambier, Nos. 1 & 2	170	18.50	14.50
Gutta Percha, 1st quality	...	550.00	450.00
Medium	...	450.00	300.00
Lower	...	200.00	50.00
Borneo Rubber,	...	134.00	70.00
Gutta Jelutong	...	7.00	7.00
Nutmegs, No. 110's	...	52.00	51.00
No. 80's	...	70.00	70.00
Mace, Banda	...	95.00	85.00
Amboyna	...	70.00	66.00
Pepper, Black	1,253	32.00	30.37½
White	178	55.00	51.50
Pearl Sago, Small	185	4.90	4.35
Medium	...	5.00	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	2,123	3.65	3.45
No. 2	285	3.50	1.90
Flake Tapioca, Small	1,007	8.30	5.25
Medium	28	6.00	5.25
Pearl Tapioca, Small	328	6.25	5.00
Medium	1,243	7.75	5.40
Bullet	...	6.50	6.00
Tin	4,020	66.37½	63.50

London Market.

Cocaine.—It is reported on good authority that there will probably be a substantial reduction ere long, so that buyers would do well to purchase for immediate requirements only. Present price is very high.

Oil, Castor.—Very dull of sale. Medicinal French is quoted on the spot at 33*s.* in cases and 29*s.* for first pressings in barrels. Medicinal Italian is offered at 36*s.* 6*d.* Hull make for February delivery is £29 10*s.* per ton in barrels and $3\frac{3}{16}$*d.* per lb. in cases for medicinal oil.

Oil, Citronella, is unchanged at 9½*d.* per lb. for drums, and 10*d.* for cases.

Spices.—The auctions on Wednesday were small, and contained little of interest except a large quantity of Zanzibar Cloves, damaged by water, which sold at $2\frac{7}{8}$*d.* to 3*d.* per lb. Good quality was bought in at $4\frac{1}{4}$*d.* per lb. The March-May at $4\frac{1}{32}$*d.* per lb. A small lot of brown rough Cochin Ginger, slightly mouldy and wormy, was bought in at 50*s.* per cwt. A few barrels of Jamaica sold at 44*s.* 6*d.* for dull medium; the rest being bought in. Fair red Nyasaland Chillies sold at 52*s.* per cwt. and part of a parcel of Japan at 44*s.* per cwt. Fine Egyptian *Capsicums* were bought in at 50*s.* per cwt. *Pimento* was rather easier; a few lots of common and ordinary sold at 3*d.*, fair being held for $3\frac{1}{4}$*d.* per lb. Common *Cinnamon-quillings* sold at $6\frac{1}{2}$*d.* per lb. Middling red Mace was bought in at 1*s.* 5*d.* per lb. Black Pepper sold at $6\frac{1}{8}$*d.* per lb. for fair Singapore, and at 6*d.* for greyish. Malabar, rather shrivelled and grey sold $5\frac{7}{8}$*d.* per lb. Singapore white is slightly dearer, at 10*d.* per lb. on the spot, and at $10\frac{3}{16}$*d.* for January-March shipment. Penang is also dearer at $9\frac{9}{16}$*d.* on the spot, and $9\frac{5}{8}$*d.* for early shipment.

THE CHEMIST AND DRUGGIST.
London, January 18th, 1902.

Per Mail advices of January 17th, 1902.

Coffee.

The London Commercial Record says:—Supplies continue on a limited scale, and the market opened with a steady tone, but subsequently the demand fell off and sales were made with difficulty at a decline of fully 1*s.* per cwt. for all except fine bold quality Costa Rica, which brought very high prices. Futures of Brazil opened with a better demand at a slight advance, but with lower prices from abroad and a falling exchange; the market has become decidedly flat, and the closing price of March Santos shows a decline of 1*s.* 9*d.* per cwt. for the week.

Yesterday business was done in March delivery Santos at 34*s.* to 33*s.* $10\frac{1}{2}$*d.*, May at 35*s.* to 34*s.* $7\frac{1}{2}$*d.*, September at 36*s.* to 35*s.* 9*d.* and December at 36*s.* $10\frac{1}{2}$*d.* to 36*s.* 6*d.*

London	Santos	March delivery	... 33*s.* 9*d.*
New York	No. 7 Rio	„	... 6.20 cts.
Hamburg	Santos	„	... $33\frac{1}{2}$ pf.
Havre	Santos	„	... $41\frac{3}{4}$ francs.

Imports, Deliveries and Stock of Coffee in London are as follows:—

	Stock.		Imports.	
	1902.	*1901.*	*1902.*	*1901.*
Tons	13,034	14,788	1,704	908
	Home Consumption.		Exports.	
	1902.	*1901.*	*1902.*	*1901.*
Tons	691	742	335	365

The preceding figures exhibit—

In the Imports an increase this year of	... 796	Tons.
„ Home Consumption a decrease of	... 51	„
„ Export a decrease of ...	... 30	„
„ Stock a decrease of ...	1,754	„

The results of this week's auctions are as under—

East India.—Of 157 bags offered 100 bags sold—Wynaad, smalls 44*s*. 6*d*., low middling 53*s*. 6*d*., bold 64*s*. 6*d*., peaberry 60*s*.

Nyassaland.—14 bags bought in.

Jamaica.—Of 69 barrels 51 bags offered 26 barrels sold small greenish 39*s*. 6*d*., fine ordinary 46*s*. 6*d*., low middling 56*s*. to 56*s*. 6*d*., peaberry 46*s*. to 54*s*.

Costa Rica.—Of 792 bags offered 530 bags sold—smalls 44*s*. 6*d*. to 52*s*. 6*d*., good ordinary pale 47*s*., middling dull grayish 59*s*. to 62*s*. 6*d*., good middling blue 71*s*., fair bold 68*s*. 6*d*. to 69*s*., good to fine blue bold 85*s*. 6*d*. to 103*s*., peaberry 45*s*. 6*d*. to 100*s*.

Guatemala.—97 bags sold—smalls 39*s*. 6*d*., low middling 50*s*. to 53*s*., bold 63*s*., peaberry 55*s*.

Salvador.—Of 179 bags offered 30 bags sold—smalls 44*s*.

Mexican.—61 bags mostly sold—low middling coloury 55*s*., bold 67*s*. 6*d*., peaberry 54*s*.

Colombian.—230 bags damaged mostly sold—smalls 35*s*. to 39*s*., low middling 46*s*. to 51*s*. 6*d*., bold 52*s*. 6*d*. to 60*s*., peaberry 44*s*. 6*d*. to 48*s*. 6*d*.

Brazil.—Of 3,300 bags unwashed Dumont Santos quay terms 660 bags sold—small pale greenish 34*s*. 6*d*., medium 36*s*. 6*d*., bold 39*s*. 6*d*., peaberry 31*s*. 350 bags washed Dumont Santos were bought in; also 25 bags Rio Maragogipe, 500 bags Santos, and 502 bags Bahia.

Receipts in Rio and Santos.

Since July 1st	*1901–02.* Bags.	*1900–01.* Bags.	*1899–00.* Bags.	*1898–99.* Bags.
Rio ...	3,624,000	1,733,000	2,223,000	1,995,000
Santos ...	7,309,000	5,650,000	4,815,000	4,057,000
Total ...	10,933,000	7,383,000	7,038,000	6,052,000
Crop ...		10,900,000	8,971,000	8,772,000

Rio Exchange $12\frac{7}{32}d.$, previous day $12\frac{5}{16}d.$

Havre, Jan. 16th.—Good average Santos January opened steady at 42 f. and closed quiet at 41¼ f., March opened at 42½ f. and closed at 41¾ f., May opened at 43¼ f. and closed at 42½ f., September opened at 44½ f. and closed at 43¾ f., December opened at 45 f. and closed at 44½ f.

Hamburg. Jan. 16th.—Good average Santos January opened quiet at 33¾ pf. and closed dull at 33 pf., March opened at 34 pf. and closed at 33½ pf., May opened at 34¾ pf. and closed at 34¼ pf. September opened at 36½ pf. and closed at 35½ pf. December opened at 36½ pf. and closed at 36 pf.

New York, Jan. 16th.—Closing prices of No. 7 Rio were as follows:—

	Jan.	Feb.	Mar.	April.	May.
January 16 ...	6.05	6.10	6.20	6.30.	6.35
January 15 ...	6.20	6.25	6.35	6.40	6.50

PLANTING OPINION, MADRAS.
February 8, 1902.

The Weather for January.

The precipitation in Singapore was far above the average 17·97 being recorded and for the first three weeks, it practially rained continuously. There was a marked contrast to this in Penang, where 1·01 only was recorded. Malacca was also on the dry side with 4·74 only. Perak shewed great differences, for while at Tapah the heavy fall of 19·61 was registered. Bagan Serai had only 2·45 In Selangor, Jeram recorded 11·07 whilst at the District Hospital 2·76 only fell. The Returns from Pahang shew that little rain fell there the greatest fall being at Kuala Lipis 2·36.

Singapore.

Abstract of Meteorological Readings for January, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·892	131·2	77·2	84·4	71·4	13·0	75·6	·832	74·5	84	N. E.	17·97	6·10

K. K. Hospital Observatory,
Singapore, 17th January, 1902.

A. B. LEICESTER.

Assistant Surgeon and Meteorological Observer.

Penang.

Abstract of Meteorological Readings for January, 1902.

Station.	Mean Barometer.	Mean Temp. Air.	Mean Maximum.	Mean Minimum.	Mean Range.	Mean Sun.	Mean Grass.	Prevailing Direction of Winds.	Mean Velocity.	Mean Vap : Tension.	Mean Humidity.	Dew point.	Rainfall.	Greatest Rainfall in 24 hours.	Remarks.
	ins.	°F	°F	°F	°F	°F	°F		miles.	°F	%	°F	ins.	ins.	
Prison Observatory ...	29·890	80·6	89·3	73·3	16·0	141·3	65·3	N.W.	151·12	·751	·66	67·6	1·01	·67	

G. D. FREER,
Acting Colonial Surgeon, Penang

Penang, 25th February, 1902.

Malacca.

Abstract of Meteorological Readings for January, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		ins.	ins.
General Hospital.	29·835	144·5	82·3	87·4	67·6	19·8	80·6	1·034	49·1	93	N.	4·74	2·25

Malacca, 4th February, 1902.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for January, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	157·50	80·33	92	69	23	76·20	·850	82	9·46	1·60
Kuala Kangsar ...	...	80·31	93	68	25	75·12	·803	78	3·75	1·77
Batu Gajah ...	159·00	80·65	93	69	24	76·13	·841	80	3·95	1·02
Gopeng ...	...	80·20	92	65	27	76·93	·843	82	6·48	1·66
Ipoh ...	...	80·40	94	69	25	75·53	·820	79	4·99	2·02
Kampar ...	...	...	92	68	24	...	...	...	13·06	3·47
Teluk Anson ...	...	80·22	91	71	20	77·23	·895	87	9·75	2·75
Tapah ...	..	79·88	92	67	25	75·73	·836	82	19·61	3·70
Parit Buntar ...	...	81·15	94	69	25	76·00	·830	78	2·53	·88
Bagan Serai ...	...	80·69	90	69	21	76·20	·844	80	2·45	1·37
Selama ...	...	81·63	93	70	23	76·84	·858	80	2·89	1·37

STATE SURGEON'S OFFICE,
Taiping, 12th February, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for January, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·882	149·8	80·0	90·1	70·9	19·2	76·7	0·854	74·5	83	Calm	3·77	2·04
Pudoh Gaol Hospital "	...	...	...	...	...	...	...	...	...	...	...	3·03	1·55
District Hospital "	...	...	...	...	...	...	...	...	...	...	...	2·76	1·15
" Klang	...	...	...	84·6	72·8	11·8	...	...	...	...	...	5·83	1·70
" Kuala Langat	...	...	...	86·4	74·5	11·9	...	...	...	...	...	7·05	3·01
" Kajang	...	...	...	84·1	75·0	9·1	...	...	...	...	...	4·53	0·96
" Kuala Selangor	...	...	...	85·0	73·9	11·1	...	...	...	...	...	7·81	1·88
" Kuala Kubu	...	...	...	88.2	71·5	16·7	...	...	...	...	...	10·95	5.40
" Serendah	...	...	...	85·5	72·7	12·8	...	...	...	...	...	8·06	2·70
" Rawang	...	...	...	85·3	73·6	11·7	...	...	...	...	...	6·77	1·62
" Jeram	...	...	...	...	...	...	...	...	...	...	...	11·07	2·83

State Surgeon's Office,
Kuala Lumpur, 17th February, 1902.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for January, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kuala Lipis - -	...	...	...	94·5	70·0	19.3	...	...	...	...	...	8·17	2.36
Raub - -	...	...	...	89·0	69·0	15.51	...	...	...	...	...	7·18	1·76
Bentong - -	...	...	...	90·0	64·0	21.5	...	...	...	...	...	7·83	1·85

RESIDENCY SURGEON'S OFFICE,
Kuala Lipis, 12th February, 1902.

P. N. GERRARD, M. D.,
Acting Residency Surgeon, Pahang.

No. 7.] APRIL, 1902. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commerical value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN
OF THE
STRAITS
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FEDERATED MALAY STATES.

No. 7.] APRIL, 1902. [Vol. I.

THE TIMBERS OF THE MALAY PENINSULA.

Continued.

Apetalæ.

Nepenthaceæ.

The larger species of pitcher plants *Nepenthes ampullaca* Jack and *N. Rafflesiana* Jack. Are used for binding hedges, the stout and tough woody climbing stems being collected for this purpose.

Myristicaceæ.

The only genus of this order, *Myristica* is extensively represented here, and includes some trees of considerable size, though none attain the vast dimensions of some groups. The wild nutmegs rarely contain any aromatic properties, and as spices are worthless. Some of the jungle nutmegs are called Pala by the natives, others are known as Pendarah, Menara etc. The timber in the bigger trees is suitable for building, posts, beams and planks but is of second quality.

Myristica intermedia, Bl. Pandarah Kikeh.

A medium sized or small tree common in woods, with narrow leaves glaucous on the back and small nutmegs, has a reddish fawn coloured wood, moderately heavy, rings indistinct, rays very fine, and numerous moderate sized pores, usually double. Weight 23 lbs. 8 ozs. Not a high class wood but when large enough suited for house work.

M. crassa, King. Pala Bukit.

Attains a fairly large size, 20 to 30 feet tall, the timber is red and heavy.

M. irya, Gaertn. Piangu.

Attains a height of 60 or 70 feet with a good straight stem, and is suited for beams and planks.

M. polysphærula, Hook fil.

A dark brown wood, floats in water, used in house-building.

M. glaucescens, Hook fil. Singga Putih.

Attains a height of 60 to 80 feet. Beams 5 to 8 feet square can be had. Wood red, used in building.

M. racemosa, Bl.

Rather a rare tree. Wood poor and light, soft whitish brown. Weight 20 lbs.

LAURINEÆ.

Nearly all in this order are trees some of considerable size, and in the greater number the timber when sufficiently large is of good quality, the chief exception here being in the genus *Cinnamomum*, the wood of which is poor and bad. The timber has nearly always a yellow tint, often when fresh of a bright yellow colour. The name Medang is applied to a considerable number of the Laurineæ, though a few timbers of other orders are called Medang, and the name Mendong or Medong (*Elæocarpus*,) order *Tiliaceæ*, is often accidentally converted into Medang by error.

Cryptocarya.

Includes a number of trees often of considerable size.

C. Griffithiana, Wight. Sigun. Medang Buaya.

A tall tree 60 to 65 feet in height. Wood close grained hard and durable pores scattered small arranged in lines, rays very fine, rings obscure, red heavy. Weight 36 lbs. to 51 lbs. A good building wood.

C. ferrea, Bl. Mumpat jantan.

Attains a height of 80 feet, wood brownish, gives good beams.

Cinnamomum iners, Reinw. Kayu Manis Hutan.

A small sized tree about 30 feet tall, with a stout trunk in old specimens. Very common in secondary growth. The wood is soft and usually white, the heartwood becoming brownish in older trees. It is a tree of fairly rapid growth though never attaining any great size. The bark is slightly aromatic and it and the fruits are sometimes used as a spice by Malays. The wood is only useful for firing. Weight 19 lbs. 5 ozs. to 40 lbs. 8 oz. Average 23 lbs.

C. sulphuratum, Nees. Singgeh putih betina.

A rarer species occurring in Selangor, is said to have good red wood suitable for building. It attains a height of 50 or 60 feet and gives beams 5 or 6 inches square.

C. parthenoxylon, Meissn. Kayu Gadis.

A tall straight tree with rough longitudinally furrowed bark, occurs commonly in Penang and Perak. It grows about 40 feet tall.

The wood is rather soft and brownish in colour with numerous medium-sized pores, very fine rays and obscure rings. Weight 33 lbs. 4 ozs. A good ordinary building wood.

Alseodaphne umbelliflora, Hook fil. Medang Loso.

A tree 30 to 40 feet tall, squaring to five or six inches, wood durable good for house work.

Phoebe multiflora, Bl. Medang Ketana, Medang Tuloh, M. Asam, M. Pasir.

A big tree stated to grow to 100 feet, wood very durable. The Medang Ketanah of Johore is a fine dark olive brown wood when old and dry, light yellow when fresh, close grained and heavy, pores small and numerous, rays very-fine, rings fairly distinct. A good wood for house building and furniture.

Actinodaphne, Sp. Medang Kuning, or Kunyit.

A tree about 30 or 40 feet high with very large leaves, the flowers borne in clusters on the bark. Wood durable good for planking, boats, house beams, and furniture.

Act. Maingayi, Hook fil.

Only a small tree as far as I have seen, with very large leaves pubescent beneath. The wood is yellowish olive with numerous pores, very fine rays, and fairly distinct rings.

Act. pruinosa, Hook, fil.

A small or medium sized tree.

Wood pale yellowish olive, heavy dark brown in section, pores small very numerous, rays visible in young wood, rays fine and close. A good useful wood. Weight 48 lbs. 15 ozs.

A. sesquipedale, Hook fil.

Tree with very large leaves, wood yellowish with rather large rays, pores very numerous medium size.

Eusideroxylon Schwageri, Teysm. Billion.

A very large tree, native of Borneo, well known for its excellent timber which is very hard, heavy and durable. The tree which has been planted in Singapore is of very slow growth. The timber is deep brown when old, with numerous small pores, the rays quite invisible in section. Newton states that it is of a drab colour when cut which quickly changes under exposure to much darker, immensely hard and difficult to work. It splits readily into shingles which are very lasting.

Litsea myristicæfolia, Wall. Medang Bunga.

A tree usually of no great size but sometimes growing to 50 or 60 feet. Timber considered inferior fawn colour, used in building.

L polyantha, Juss. Medang busuk.

A fairly large tree 70 to 80 feet tall, common. Wood said to be fœtid, good for planks.

L. penangiana, Hook fil.

Small tree common in woods. Wood fairly heavy yellowish, pores very numerous, rays fine. Good for posts etc., but small. Weight 38 lbs. 4 ozs.

L. sp. (2371).

Small or medium sized tree, wood yellow close grained, rings distinct, pores mediocre in lines, rays obscure. Weight 37 lbs. 2 ozs

Medang Tandok.

A very fine wood obtained in Selangor evidently belongs to the *Laurineæ*. It is very heavy and hard dark brown with darker irregular rings, the rings of growth are exceedingly fine and numerous undelating, pores small and scattered, rays very fine. A first class wood. Weight 64 lbs.

Medang Keladi, (Johor). Weight 24 lbs. 12 ozs.

Lindera malaccensis, Hook fil.

A tree about 30 feet with a smooth barked stem about 8 inches or more in diameter, with dark polished green leaves and yellow flowers, bark thin, sapwood about a quarter of the stem, light brown, heartwood yellow, rings distinct, pores medium sized often divided, rays rather distant. A soft and not heavy wood, very much resembling a wood known as Medang Kok, and used for light work such as boxes and the like. Common in the south of the Peninsula.

PROTEACEÆ.

Helicia excelsa, Bl. Membatu Laiang.

A medium sized tree. Wood light brown with remarkably broad rays connected by close transverse bars, pores small usually double, rings distinct rather distant. Weight 41 lbs. 7 ozs. A very curious wood.

H. petiolaris, Benn. Gong, Putat tepi and *H. robusta*, Wall.

Are woods of very similar structure. All are used in house building, but are not high class timbers, and indeed attain no great size. Weight (*H. petiolaris*) 73 lbs. 4 ozs.

THYMELEACEÆ.

Aquilaria malaccensis, Lam. Gaharu.

A large tree, well known from its producing the highly valued incense wood Gaharu. This is the altered heart wood of old trees, but only a small percentage of trees contain it. The ordinary wood of the Gaharu is fawn-white light and soft, pores large and numerous, a wood of no value but used for boxes and such like work occasionally. Weight 25 lbs. 14 ozs. A common tree all over the Peninsula.

EUPHORBIACEÆ.

A large order containing a very large proportion of trees few of which are of vast size, most being medium to small sized trees. The timber of most is rather soft, and light coloured, in some dark brown and hard.

Bridelia.

A genus of small trees or shrubs, the biggest of which is *B. pustulata*, Hook. fil. Kenidai hutan or Bubongkal. Attaining a height of 30 or 40 feet with a fairly hard durable dark brown wood used for posts and rafters of houses.

Glochidion.

Small to medium trees with small yellow or red flowers and capsular fruit. Most of the species are known as Ubah by the Malays. The timber when large enough is used in house building and is hard and durable.

Gl. superbum, Baill.

A small tree with large leaves common in secondary growth. Wood reddish brown compact with fine rays and numerous large pores, rather light. Used for rafters and light building, and also for firewood. Maingay gives this as Medang Kuneat (Medang Kunyit) and Tamangow and says it is used for common work. Wood olive yellow becoming reddish towards centre. Weight per cubic foot 37 lbs. or 55 lbs. 11 ozs. A Singapore specimen weighs 43 lbs. 9 ozs.

G. microbotrys, Hook fil.

A fairly heavy reddish brown wood with wavy fibres numerous, rather large pores, fine. A fairly good house building wood. Weight 40 lbs. 10 ozs.

Gl. laevigatum Hook fil,

A small sized tree common in secondary jungle. The wood resembles that of *G. superbum*, but more reddish in colour. The tubes are lined with some white shining substance when dry. Weight 51 lbs. 12 ozs. to 58 lbs. 8 ozs.

G. brunneum, Hook fil. Ranang. Ubar Merah.

Attains a height of 30 to 40 feet, but is only used for rafters and firewood.

G. goniocarpum, Hook fil. and *G. littorale*, Bl.

Have rather light brown wood. Weights 33 lbs. and 37 lbs. 2 ozs.

G. sericeum, Hook fil.

Which never attains any considerable size, has soft whitish wood. Weight 58 lbs, 8 ozs.

Cleistanthus sp.

A medium sized tree. Timber light fawn colour with distinct rings, very fine grained, rays fine undulate with obscure transverse bars.

C. hirsutulus, Hook, fil.

A small tree the wood of which is more curious than useful. It is of a dirty brown colour with wedge shaped rays very unequal in width, and numerous transverse bars, pores large but very few.

It occurs in Langkawi and Perak.

C. myrianthus, Kurz.

Tree of fairly large size with coppery leaves.

"Wood moderately hard reddish grey, pores small numerous, often subdivided; rays fine very numerous closely packed, 41 lbs. cubic foot" (Gamble Man. Ind. Timbers, p. 357). Occurs in Singapore.

Daphniphyllum laurinum, Baill.

A tree usually of no great size 20 to 30 feet, common in Singapore with dirty light brown wood fairly heavy, rays very close and fine, pores comparatively few and large double and arranged in horizontal rows.

Weight 38 lbs. 15 ozs. to 41 lbs. 15 ozs.

An inferior wood used for boat building and houses.

Aporosa.

Trees of no great size with small catkins of yellow flowers, and yellow fruits. The timber as a rule is fairly good, but unfortunately too small usually to be of great use.

A. aurea, Hook, fil. Sebasah.

Is fairly large at times, attaining a height of 30 or 40 feet, and thick enough to supply beams. It sinks in water. It can be used in house building.

A Praineana, King. Petaling Tandok, Masekam Putih.

A medium sized tree with dark chocolate coloured wood, used for house building. Beams and rafters.

A. nigricans, Hook, fil.

Medium sized tree with dark green leaves wood dark brown with wavy fibres, some of the rays are very broad. Weight 49 lbs. 8 ozs. A fairly good wood, though not large, for rafters.

A. ficifolia, Baill.

A heavy dark brown wood, rings wavy obscure, pores numerous medium sized, simple, lined inside with some white substance, rays fine and broad mixed, with numerous minute transverse bars. Weight 50 lbs. A good useful wood.

Antidesma.

All small trees chiefly used for firewood, or rafters and such work.

A. bunias, Spr. Bras-bras hitam.

Has a hard compact deep brown wood, with medium-sized pores, and very fine rays.

Used for beams, rafters and the like. A fairly good wood but not durable if exposed to the weather.

A. cuspidatum, Muell.

A small tree with hard compact close grained dark red wood, rays fine, pores numerous and small, rings obscure. A good wood for small work, hard and heavy but it never attains any great size.

A. ghæsembilla, Gaertn. Kasumba.

"A small tree, wood white, grain very coarse, soft splits in drying, used for light rafters for native huts, cheap but inferior. Weight cubic foot 23 lbs. 4¾ ozs. (Maingay) lc." I have usually met with this as a bush but it is not very common. Gamble describes it as a small deciduous tree, wood red, darker coloured heartwood, smooth

hard close and even grained, annual rings indistinctly marked by concentric lines, pores small and moderate sized uniformly destributed. Rays of two sizes, few moderately broad rays with numerous fine rays between them, 49 lbs per cubic foot.

Baccaurea.

A large genus of trees of no very great size with fruits either in the form of a berry or a capsule, the seeds enclosed in an eatable aril. The timber, as a rule, is hard and good, in some light yellowish white, in others dark brown.

B. Motleyana, Hook, fil. Rambai.

A well known fruit tree. It seems never to attain any large size and usually branches much low down. The bark is thin and flaky, light coloured, and the wood rather soft and light coloured .similar to ashwood in colour, the rays are rather thick and the pores large. Weight 33 lbs. 12 ozs. to 87 lbs. 2 ozs.

A good fire wood.

B. parviflora, Muell. Setambun.

This is quite a small tree about 20 feet tall and usually much less, and about three inches through. The flowers are borne on the old wood in great masses, the females at the foot of the tree, the males higher up. The stem is usually knotty and the wood very compact and hard, wherefore it is often used as a club by Malays. It is light fawn colour, or yellow with large and fine rays mixed and connected with very small transverse bars, pores few and small. Weight 23 lbs. to 51 lbs.

Though the tree is small from the peculiarly hard close grain of the wood it might perhaps be of use for work in which box-wood is commonly used.

B. symplocoides, Hook fil.

A small tree common. Wood close grained light fawn colour with distinct rings, rays rather distant, and broad, pores many small and few. A hard compact wood something like the previous one.

B. Wallichii, Hook fil. Gintek Merah.

A tree 40 to 60 feet tall has red wood suitable for beams, being durable.

B. Malayana, King. Tampoi.

A well known fruit tree 50 to 60 feet tall, has rather light coloured brown wood with tolerably distinct rings and numerous moderate sized pores, the rays are mixed fine and broad ones and there are fine transverse bars running across as in the other species. Weight 54 lbs. A durable wood but rather liable to split; useful for beams, posts etc.

B. bracteata Muell.

A common medium sized tree, has wood very similar to that of Tampoi, but the transverse bars are finer and the colour is darker. Weight 78 lbs. 12 ozs.

B. minor, Hook fil.

Wood has the same structure as that of, the preceding kinds, but is of a light reddish fawn colour. Weight 46 lbs.

B. reticulata, Hook fil. "Tampoa" (Maingay.)

"Wood dullred, grain medium fairly hard does not split, in drying. Weight cubic foot 52 lbs. 6 ozs." (Maingay in Kew Bulletin.)

Croton Griffithii, Hook fil.

Small tree common all over the Peninsula. Wood whitish-fawn colour, close and fine grained, rays very fine, and close rings distinct, pores few. Too small to be of much use.

C. argyratus, Bl. Hamba Rajah.

A rather bigger tree with ovate lanceolate leaves silvery on the back. Used for building in Penang and elsewhere.

Elateriospermum Tapos, Miq.

The Poko P'rah is a very large and fine tree abundant in the forests of Selangor and Perak. It attains a height of 80 or more feet and has a hard and durable wood.

Macaranga.

The Mahangs are all comparatively small trees usually most abundant in secondary growth. Few ever can be seen in original jungle, but it is not rare to find patches of *M. javanica* and *M. hypolenca*, surrounded by forest, a sure sign that the ground has formerly been cleared and burnt. They are of rapid growth and often very short lived, the wood usually soft and white is only valued as firewood and a few other purposes. The bark of some species contains a fibre which an attempt has been made to utilize, but it is rather inferior.

M. javanica, Muell. Mahang Bayan.

A small short lived tree very common in secondary growth coming up in lalang and low scrub as soon as any tree, and comparatively uninjured by grass fires. Height about 20 to 30 feet.

Wood dull brown and fairly heavy, rings wavy distinct, pores fairly large two or three together in short rows, rays indistinct fine. Sapwood soft. Weight 40 lbs. to 40 lbs. 8 ozs. Too small to be of much use except as firewood, but it is one of the trees which growing rapidly in lalang assists to re-afforest the ground.

M. triloba, Muell. Mahang Kukur.

Common in secondary growth and on borders of woods.

Wood light brown, not heavy, pores large and numerous, rays very fine. Weight 47 lbs. 4 ozs.

M. hypoleuca, Muell. Mahang putih.

One of the biggest of the Mahangs with a smooth white stem and grey green leaves with white backs. Common in secondary growth wood soft and light, usually, light coloured with large pores. Weight 10 lbs. 7 ozs.

Of very little use, sticks of wood are preferred by the Chinese for setting Gambier with.

M. megalophylla, Muell.

A medium sized tree with very large leaves. Wood soft light brown, light. Pores large, rays numerous wavy and close much broken up. A rather poor wood, chiefly used for windmills for scaring birds. Weight 26 lbs. 10 ozs.

M. populifolia, Muell.

A fairly large tree, with ovate dark green leaves. Wood pale brown moderately hard, rather light coarse grained, pores large, rings distinct irregular, rays very obscure. A better class of wood than most of the genus.

Endospermum malaccense, Muell. Senduk senduk.

A fairly large tree with grey bark, attains a height of about 80 feet with a stout stem.

Wood soft white, with large scattered pores subdivided by partitions into two or three, several together, rays very fine. A light soft wood used for planks but chiefly for making clogs, in the same way as Jelutong; Maingay gives the name of this as Mudang Klabos (Medang Klabu) and says, the wood is whitish orange becoming more red in the centre. He gives the weight as 44 lbs. 5 ozs. per cubic foot. Singapore specimen weighs 23 lbs. 10 ozs.

Sapium discolor, Muell.

A very common tree with smooth bark and small leaves with white backs.

The wood is soft and light with very few large pores, and no rings. A poor useless wood. Weight 23 lbs. 4 ozs. to 24 lbs. 12 ozs.

Excœcaria agallocha, L.

A sea shore tree with dark polished green leaves, and poisonous milk. It has very similar soft useless wood. Weight 54 lbs.

URTICACEÆ.

Gironniera nervosa, Planch. Medang Ampas Tebu.

A medium sized tree about 60 feet tall and wood light coloured yellowish fawn rather soft with large scattered pores, and medium sized rather distinct rays, coarse grained and light "splits deeply in drying." Used in building, planks etc., but is not durable and does not stand exposure. Maingay gives weight as 31 lbs. 15 ozs. per cubic foot. Singapore 31 lbs. 8 ozs. to 34 lbs. 10 ozs.

G. subaequalis, Planch. Medang Kasap Jantan, Medang Hitam.

About 30 feet tall stem usually straight. The timber has much the same structure as the last, but is heavier sinking in water and rather darker, a yellowish brown colour, the rings are visible and irregular, the pores more numerous. Like the last it is used for planking and beams 5 to 6 inches square can be had, but is not durable. Weight 37 lbs. 2 ozs.

G. parvifolia, Planch. Medang Kuruseh.

Is a smaller tree, chiefly occurring in hill jungles but widely scattered. It is said to run to 70 feet tall, but I have seen none

as large. The wood is heavier and more compact with distinct rings, small numerous pores, and fine but unequal rays joined by transverse bars like the wood of *Baccaurea*. Weight 51 lbs. It is a better wood than that of the two previous ones and is used for planks, beams etc.

Trema amboinensis, Bl. Narong.

A shrub hardly a tree with soft and light pale reddish wood, rings fairly distinct, rays narrow unequal and rather distant.

Common in secondary growths and thickets. This wood is only used as firewood here, but in India and Ceylon is valued to make charcoal for gunpowder and fireworks. It appears to be a bigger plant in India and of rapid growth. Gamble mentions a tree which grew 25 feet in five years with a girth of 40 inches and gives the weight at 28 lbs. per cubic foot, S. 24-28. He says it may be used in plantations to keep down grass jungle and is used to shade coffee. Here through rapid in growth it usually stops soon only attaining a height of 12 or 15 feet. The bark gives a fibre used in India.

Antiaris toxicaria, Bl. Ipoh or Upas Tree.

A tree of vast size with thick bark and white soft wood. It is well known for its poisonous latex used in the Sakai dart poison. Weight 37 lbs. 2 ozs.

Sloetia sideroxylon, Teysm. Tampinis.

This valuable tree occurs all over the Peninsula and in the Rhio Archipelago.

It attains a height of 60 to 80 feet, trees of that size are now rare. It has small dark green lanceolate rather papery leaves, the ma'e flowers in a yellow catkin, at the base of which are one or more female flowers which are larger and green. The fruit is white, and the succulent surrounded by two swollen white sweet sepals, which by pressure eventually eject it. The twigs and leaf stalks contain a small amount of white latex.

The timber is one of the best in the Peninsula, being hard and durable, attacked neither by white ants nor by fungi. The sapwood is light coloured yellowish white, the heartwood dark red. Though there is usually a considerable amount of sapwood, yet even that is hard and good and appears to be what the Malays know as Tampinis putih. When fresh cut the tree exhales a peculiar strong odour. The heartwood is dark brown or red brown with irregular darker rings broad and distant, pores in rows numerous small and containing a resinous matter, rays very fine much finer than the pores.

Newton gives its weight as 61-41 lbs. per cubic foot. Specimens from Singapore weigh 54 lbs. 6 ozs. to 78 lbs., from Lingga 70 lbs. 5 ozs.

Newton says that it shows the greatest strength of any wood he examined (1,732 lbs. being given as its breaking weight, against 1,529 lbs. in Daru, the next highest) but it appears to be deficient

in stiffness though it possesses the quality of toughness in a high degree.

With respect to durability it is equal to and probably superior to any wood in the Straits. Newton cites as examples that in opening up the roof of the Town Hall in Singapore in 1879, it was found that the tie beams of Kumpas had been entirely destroyed by termites, which not one piece of Tampinis was touched, and all the timbers were used in the new roof. The Town Hall was then 20 years old. Again when Crawford Bridge was rebuilt the main timbers were found to be Tampinis in excellent condition, and the bridge being not less than 30 years old. Several of the older houses in Singapore have Tampinis beams and posts, among which is the Botanic Gardens House. The beams here are as sound as the day they were put up. The wood in fact is proof against fungus, termites and teredo.

Besides its use for building, smaller stems are in much request for carrying poles, gambier stirrers and such like articles, where strength is required. Veth (Midden Sumatra) says it is used for sugar mills, and wheels. The tree grows in forest and secondary scrub, shooting up again when the main stem is felled, but as it is often cut again and again for carrying poles and such things, it is gradually dying out. In very dense woods it produces single unbranched stems of large size but where exposed on in light woods, it is very apt to throw up a large number of stems and branch very low down.

Ficus.

A large genus of trees and shrubs some of very large size. The wood is as a rule almost useless, even as firewood, it is soft and usually white with no distinct heartwood. Structurally it is most remarkable for the distinctness of the rings of growth, which may be connected with the fact that at least some of the Figs have a habit of completely shedding their leaves and so "wintering" for a short time but the period of absolute bareness of the tree is usually very short, not more than a day or two. Some few of the smaller kinds produce a fibre in the bark (*F. chartacea*,) and all contain a latex which, however, only produces *caoutchouc* in one or two species such as the well known *F. elastica* Getah Rambong.

F. bracteata, Wall.

Large shrub or small tree. Wood soft and rather light splits readily, light reddish fawn colour, pores rather large scattered some partitioned, rings distinct very narrow about 50 to the inch, rays obscure fine. Weight 31 lbs. 8 ozs.

F. Benjamina, L. Waringin.

A common cultivated tree, attaining a fairly large size but with a rather thick short trunk. Wood very light, pale reddish fawn and white, rings distinct broader than the last and wavy, pores large not very numerous. Weight 41 lbs. 10 ozs.

F. rostrata, Lam.

A dirty white wood, closer grained than the last, rings not visible, pores numerous small, rays very fine. Weight 44 lbs. 5 ozs.

F. xylophylla, Wall.

A big shrub or small tree with a thick trunk.

Wood poor and soft reddish fawn, rings distinct, more distant than in *bracteata,* pores large. Weight 36 lbs.

F. Miquelii, King.

A common tree in secondary growth with the figs in dense masses on the stem and branches. Attains a height of 30 feet or more with a girth of 3 feet, bark grey smooth. Wood soft and poor light, pale white to brownish wood, rings fairly large and distinct, pores very irregular medium and smaller scattered. Weight 23 lbs. 6 ozs. to 30 lbs. 8 ozs.

This tree regularly sheds its leaves.

F. indica, L.

Wood reddish brown light, rings distinct close and regular, pores small scattered not very numerous, rays very fine with larger ones intermixed, not very distinct. Weight 43 lbs.

Ficus benghalensis, L.

A tree often planted here, of very rapid growth. Gamble says the wood is of little value but is durable under water and therefore used for well curbs also for boxes and panels, the wood of the drops (aerial roots) is harder and used for tent poles, cart yokes etc., the bark and small roots give a fibre for ropes. The latex used for birdlime. The wood grey moderately hard, no heartwood, pores scanty moderate sized joined by narrow concentric bands of soft tissue alternating with broader bands of firmer and darker tissue, rays fine. Weight 38 to 39 lbs. per cubic foot.

F. religiosa, L. The Pipul tree.

Is often cultivated here as a road side tree. According to Gamble the wood is used for fuel, packing cases and charcoal. Weight 23 to 45 lbs. average 34 lbs 10 ozs.

Artocarpus.

About 12 species of these fine trees occur here, all attain a good size and some are very large. The wood in all is excellent, yellow when fresh turning eventually dark brown.

A. lancifolia, Roxb. Keledang.

A large tree attaining a height of about 80 feet with a straight stem and a large crown, leaves large oblong rounded, fruit nearly globose brown occurs in forest in most parts of the Peninsula.

Heartwood hard and heavy yellow turning dark red, close grained, pores rather large partitioned, rays fine conspicuous, lighter coloured, the rings not very distinct. The sapwood is light and corky. Maingay says the grain is very coarse and soft, and that the wood does not split in drying. It is durable under ground and the favourite wood for Chinese Coffins. It is indeed a first class wood

and in considerable demand for building Chinese Coffins and such purposes. Howard Newton says it bends easily and is useful for planking vessels as it stands well in water and is buoyant. His experiments show that it is stronger than Billian but not quite so tough.

Weight per cubic foot 39 lbs. 7 ozs. (Maingay), 46–42 lbs. (Newton), specimen from Malacca 45 lbs. 12 ozs., from Penang 47 lbs. 7 ozs. from Lingga 49 lbs. 14 ozs.

A. integrifolia, Linn f. Jack. Nangka.

A well known fruit tree, common round villages. It attains a fairly large size, though not as big as some of the other species, and branches rather low down usually.

The heartwood is yellow at first becoming brown with age, pores large scattered and in rows and surrounded by softer tissue, rays fine and close lighter in colour than the intermediate tissue rings, usually distinct. Sapwood large white soft and useless.

The tree grows fast everywhere. Gamble gives the weight at 39.5 lbs.; Brandis 40 lbs. per cubic foot; Singapore 38 lbs. 15 ozs. to 35 lbs. 8 ozs. It is not eaten by whiteants.

A good furniture wood for cabinets, tables etc., also used for canoes in India. This wood is much in favour in Ceylon and India, but it appears to be very little used here although it might be had in considerable quantity and would be worth planting in forests for its timber alone. Plants, however, planted out in forests in Singapore were speedily destroyed by deer and mouse deer, (pelandok) which like goats and cattle are remarkably fond of its leaves.

A. polyphemia, Pers. Champedak.

A well known fruit tree with smooth white cylindrical heads of fruit, commonly cultivated and wild in many parts of the Peninsula and Sumatra. When grown in open country it usually forms a short stem and branches much low down as Jack is apt to, but in the wild state in the denser forest form a tall straight tree, thirty or forty feet tall, roughened with knots from which flowers and fruits have sprung.

The timber much resembles that of Jack, but the pores are slightly larger and more numerous, the rays too are rather wider and more irregular in width. Weight 37 lbs. 2 ozs. to 47 lbs. 7 ozs. It is good for house building and also used for boats.

A. incisa, Linn. Breadfruit, Sukun.

Cultivated here, but does not seem to do very well, the tree attaining no great size and the fruit being poor. The timber resembles that of the Jack, but is not so good here at least. I have seen very fine samples in Brazil where it was used for blades of paddles and other purposes.

A. rigida, Bl. Tampunei, Monkey Jack.

A well known fruit tree, with yellow globose fruits covered with short blunt processes, the seed wrapped in a sweet yellow aril, very

good to eat. The tree attains a great size and is of fairly rapid growth, with deep green foliage very ornamental.

The heartwood is light brown, or orange red, dark coloured in transverse section, pores small, rays very fine with transverse bars very fine connecting them. It is fairly heavy.

Used for building and furniture.

Weight (Maingay) 39 lbs. 11½ ozs. per cubic foot, Singapore 54 lbs.

A. gomeziana, Wall. Tampang.

A fair sized tree but smaller than a *rigida,* fruit smooth and soft subglobose two inches through green outside and pink within acid. Common in many parts of the Peninsula timber dark brown with fairly distinct rings and exceedingly numerous pores closely packed and fairly large surrounded by a corky tissue rays very fine.

Weight (Maingay) 50 lbs. 1¾ ozs. Singapore 49 lbs. 8 ozs.

A good building wood.

A. maingayi, King. Champedak Ayer.

A medium sized tree.

Wood yellowish much like Jack, with scattered rays and unequal pores. Weight 40 lbs. 14 ozs.

Used in boat building and for beams.

A lowii, King. Miku.

A fairsized tree, not very abundant.

Maingay under the name "Meyko" says wood a remarkable clear gamboge colour, grain medium, fairly hard splits very slightly in drying, used for the lid of Chinese Coffins. Weight 49 lbs. 11 ozs.

A. Lakoocha, Roxb.

A medium sized tree, not very common here. The wood resembles that of the other species but is inferior to Jack, and Keledang.

Gamble says, heartwood yellow hard, pores large enclosed in rings of soft light coloured tissue uniformly distributed rays fine and moderately broad distinct. The wood seasons well takes a good polish and is used for furniture and canoes, growth fast. Average weight 39 5 lbs. Branches gives 40 lbs.

A. Kunstleri, King. Getah Terap.

A big sometimes vast tree with strong buttresses with rather smooth bark, containing a short but fairly strong fibre. Latex used as bird lime, common over the south of the Peninsula.

Wood yellow much resembling Jack but not so good a timber, rays rather broader, pores larger. Weight 28 lbs. 9 ozs.

Pipturus mollissimus, Wedd.

A small tree abundant in some places but not generally common, wood light brown, pores numerous rather small scattered, rays conspicuous, rings obscure distant. Weight 32 lbs. 12 ozs.

MYRICACEÆ.

Myrica nagi, Thunb. Gilinche, Kusama, Kayteng.

A small tree common along tidal rivers and inland. Wood fairly

hard close grained reddish brown, pores very numerous and close, rays medium to fine. Usually a crooked tree and of little use except for fencing and such work. Weight 41 lbs. 2 ozs.

JUGLANDEÆ

Englehardtia.

Three or four species of no great size usually with winged fruits.

E. wallichiana, Lindl.

A fair sized tree occuring in Penang and Singapore. Wood brown rather light coloured, in transverse section greyer, rather light, heart wood hardly distinct but rather redder, rings distinct darker coloured broad and very irregular in width, pores rather large scattered rays very fine and obscure, a pretty wood but rather soft. Weight 35 lbs. 7 ozs.

E. nudiflora, Hook fil.

Wood grey brown, rings not very distinct, pores very numerous mixed some large others small, scattered rays medium size.
Weight 35 lbs.

CUPULIFERÆ.

There are two genera of this order represented here *Quercus* Oaks, Berangan babi of the Malays, and *Castanopsis* chestnuts " Berangan ", all are fairly large sometimes very large trees.

Quercus.

The timber of the oaks as Gamble points out may be classified in two groups. In the first all the medullary rays are very fine and numerous, in the second there are two kinds of rays, very fine ones, and very broad conspicuous ones, which in a vertical section show as broad bars, producing the appearance commonly known as silver grain. The timbers of the first class are superior to those of the latter, though the silver grained timbers are much more beautiful. Most of our common oaks here belong to the second class.

Q. Cantleyana, King.

A large tree, acorns hoary in shallow cups.
Wood light coloured yellowish, pores in rows, large surrounded by pale softer tissue, concentric rings fine wavy, no silver grain. Weight 82 lbs. 9 ozs. A dull poor coloured wood.

Q. encleisocarpa, Korth. Mempening putih.

Tree 30 to 40 feet. Acorns silvery almost completely covered by the thin cup. Common.
Bark rough thick dark brown ½ inch through. Wood light red shining in longitudinal section, pores large in long rows and groups, rings fairly distinct, rays broad darker than the surrounding tissue and remote few, concentric rings very fine wavy. A beautiful wood with a fine silver grain, rather light. Weight 32 lbs. 6 ozs. to 53 lbs. 12 ozs. Used in building

Q. Lamponga, Miq.

A very common tree about 60 feet tall and through, leaves small with silvery backs. Acorns conic hemispheric hoary, with shallow cups.

The wood closely resembles that of the preceding but has larger pores very crowded in broad rows. The sapwood is rather paler but not very distinct. A pretty wood but useless for building purposes as it soon decays and it is said to be even useless for firewood, merely smouldering when burnt. Weight 40 lbs. 8 ozs. to 42 lbs. 15 ozs.

The tree is objectionable on account of its habit of decaying up the centre and suddenly falling apparently for no reason. It is consequently dangerous near roads.

Q. costata, Bl. Resak paya.

Tree 70 to 80 feet tall, wood red brown. Good for building and planks. Rare, Perak.

Q. omalkos, Korth. Mempening putih.

Attains a height of 100 feet. Acorns smooth hemispheric in large saucer shaped cups. Not very common chiefly in hill woods.

Wood white, used for building giving beams 5 to 6 inches square, fairly durable lasting for five or six years.

Q. Rassa, Miq.

A fair sized tree with small leaves, and small acorns, usually to be met with in the hill districts at about 2000 feet altitude not rare. Attains a height of 40 to 46 feet. The timber is said to be good but I have seen no specimens.

Q. oidocarpa, Korth. Berangan Antan.

A big tree, occurs in Singapore and other parts of the Peninsula.

Timber hard heavy dark brown, with lighter coloured rays, concentric rings wavy fine numerous and close, pores in lines surrounded by lighter coloured soft tissue. A fine wood. Weight 58 lbs. 10 ozs.

Q. hystrix, Korth. Mempening merah, Mandong.

Tree 40 to 50 feet tall or more, with tomentose branches and leaves and bristly acorn cups. Common in the plains. Wood yellowish brown pale coloured. Pores fewer and larger than the preceding kinds in rows, concentric rings numerous wavy, rays broad and distant. Floats in water, used in building but poor, does not resist insects. Weight 55 lbs. 9 ozs.

Q. spicata, Sm.

A large tree, with long spikes of small acorns, not common.

Wood red very hard (Gamble) brownish white fairly hard (Maingay). Pores moderate sized and large enclosed in soft tissue in groups, patches and radial belts. Rays fine uniform with a fewer broad and very broad ones, silver grain prominent, concentrics very numerous fine and wavy. Weight 58 lbs. per cubic foot (Gamble) 43 lbs. (Maingay) used for building and charcoal (Gamble).

Castanopsis javanica, A. De C. Kata Tangga.

A big tree with large leaves, large prickly chestnuts containing one seed.

Wood light red to fawn colour, dull dark red (Maingay) sometimes tinted yellow, rays very fine and close, concentrics very fine wavy and numerous, pores rather large surrounded by softer paler tissue in short rows, rings fairly distinct. A poor wood, rather heavy and apt to split. Used for bowls and other domestic articles. Weight 58 lbs. 7½ ozs. (Maingay), (S.) 49 lbs. 9 ozs. to 58 lbs. 8 ozs.

C. Wallichii, King.

Rather a tall tree with grey bark, attains a height of 60 feet and diameter of 1½ foot. Apt to decay up the centre.

Bark grey, chestnuts spiny.

Wood pale fawn colour rather heavy, pores in rows rather small, surrounded by light coloured tissue, rays exceedingly fine, concentrics rather or very obscure. Weight 43 lbs. 14 ozs.

C. Hullettii, King. Berangan Papan.

A big tree with grey bark, about 60 feet tall and 2 feet through. Leaves large, chestnuts hardly prickly.

Wood yellowish white to brown, pores large in rows, containing a shining resin when dry, rays very fine, concentrics obscure. Weight 41 lbs. 7 ozs. to 88 lbs.

CASUARINEÆ.

Casuarina equisetifolia, Forst. "Ru."

A tall tree attaining a height of 80 feet and two feet diameter.

Common along the sea shores where sandy, and also planted. Timber heavy and hard red brown, pores mediocre to small, scattered, rays very fine, concentrics wavy fine and close, broken up. Weight 54 lbs. 10 ozs. to 60 lbs. This is a fairly fast growing tree in suitable localities. The wood is hard and suitable for posts, as it is very durable, and rarely touched by termites. It is stated to be exceptionally good as firewood, burning better than Mangrove.

DRAINING LAND FOR COCO-NUT PLANTATION.

Important as the industry of planting Coco-nuts is in the Island of Singapore, the appearance of many of them, especially of those in low lying situations is not such as would lead one to think that they receive adequate attention from the owners. The proportion which the number of weak or diseased plants in a plantation bears to that of good, healthy full-bearing trees is, unusually very high. Trees with lean and tapering stems crowned with a meagre tuft of pale leaves, often curiously clipt or marked by beetles are very much in evidence in plantations occupying low grounds. And many of these miserable specimens of coco-nut palm have, before attaining their mature growth, either stretched themselves on the ground or are fast approaching this total collapse. It need hardly

be stated that a plantation of this degenerate sort is rather a source of loss than gain to the owner.

The period of usefulness of a coco-nut or an areca-nut tree depends as much upon the depth of the pit in which the seedling is first planted as upon other conditions, such as the nature of the soil and the amount of attention bestowed upon it. That, to ensure a long period of growth and usefulness the pit must be sufficiently deep has been proved by the experience of planters and observations of the growth of the tree itself. As the tree gets older it sends out roots nearer and nearer the surface of the soil and eventually some of them appear above it in the air. The lowest roots decaying as the superficial ones appear, the tree gradually comes to depend, for its support and sustenance, upon the latter and consequently gets weaker and less able to withstand wind. Nature, however, tries to make up this weakness by sending out a larger number of roots, mostly aerial, which are but bad substitutes for sub-soil ones. As a rule the appearance of aerial roots in a coco-nut or an areca-nut tree marks the beginning of its decline which will steadily continue unless the tree is rejuvenated either by raising the level of the land by deposition of earth or by lowering the tree bodily into a deep pit dug close by, a process attended with great difficulty and risk. A shallow pit, therefore, means short life to the tree.

But in low-lying lands in the Island there is cold stagnant water below near the surface which would surely injure the roots of the seedling if care is not taken to plant it sufficiently above the level of water, and shallow pits in these cases become a necessity, and can only be avoided by continuing to get the level of the water lowered considerably below the surface of soil by draining the land. A system of drainage has been adopted with marvellous success along the Malabar coast of India (probably elsewhere also) where many hundreds of acres of waste marshy lands have within recent years been converted into valuable coco-nut plantations. This process consists in dividing the land into wide trenches and ridges, the latter being about fifteen feet (15′) apart from centre to centre and in a direction suited to the natural fall of the land. The height of these ridges can be made to vary according to the level of water in the soil; but even lands that are covered with water during the wet season of the year would not require more than three (3′) feet of earth in embankment. The minimum width of the ridges I have seen is about three feet (3′) at top. It is important to note that for the formation of these ridges no earth is brought to the land from outside, but is taken from excavations on either side. On the top of the ridge seedlings are planted in pits as deep as possible. To afford protection to the young plants and for the sake of quick returns the intervening space can be utilised either for cultivating plantains or for raising kitchen vegetables. The alternate shallow ponds of water are serviceable, especially in the hands of Chinamen, for rearing ducks or growing roots for pigs.

Drainage of this kind is no doubt beneficial to marshy land either sandy or loamy in nature, and though scarcity of labour and high

wages are difficulties in the way of effecting it, yet the high value it can confer on the land renders it worth trying.

V. K. MENON,

3.3.'02 *Veterinary Inspector, Singapore.*

AN AMERICAN REPORT ON GUTTA-PERCHA.

The report of Dr. Penoyer L. Sherman, Jr., the special agent of the Philippine forestry bureau detailed last year to visit the Straits Settlements, Java, etc., to gather information regarding Gutta-percha, has been published as an appendix to the latest report of the United States Philippine commission (mentioned in the last India Rubber World, page 98).

He reports that the principal supply of the Gutta-percha of commerce comes from points which only wild natives will or can penetrate, and the preparation and marketing of the Gutta up to its arrival at Singapore, is in the hands of the Chinese, who carefully guard all the secrets of the trade. He gained the impression that the supplies now being "worked" are rapidly diminishing, the quality decreasing, and prices increasing.

The annual output of Gutta-percha has increased but very little within the past five years, when the high prices have enticed more native gatherers into the forest. Yet even then the demand has been so out of proportion to the supply that even the Chinese have had to resort more and more to adulteration. Consequently, of the cheaper grades there seems to be plenty on hand, but of the best variety there is not more than a ton all told (at Singapore, in September, 1901), with a demand for 600 or 700 tons. From long experience the Chinese are very clever in mixing, colouring, and adulterating the finer grades with the cheaper ones, although they apparently have nothing but smell, feel, and colour to go by. And just as the natives guard the secret of the different kinds of Gutta-percha trees and their locality, so do the Chinese hide their methods of preparing Gutta-percha for foreign markets. With the supply coming from different countries and trees, and changed and adulterated in different ways, it is no wonder the kinds and varieties of Gutta-percha for sale in Singapore are very large. Of the twenty-five different varieties, the following table gives the principal ones, with their approximate amount of Gutta, and their prices (in Mexican silver, for September, 1901) as given by Low How Kim & Co., one of the largest Gutta-percha dealers in Singapore.

Kind.	*Variety.*	*Per cent. Gutta.**	*Price per picul.*
"Reds"	Pahang	78	$260
Sundek	Bulongan	69	225
Sundek	Bagan	57	210
	Serapong	56	180
	Sarawak	...	85
White	Treganor	52	85
	Pahang	...	90
	Jambui	49	...
Mixed reds	Sarawak 1	61	110
	Sarawak 2	56	90
	Sarawak 3	52	70
	Sarawak 4	...	40
Reboiled	Padang	50	90
	Penang	...	90
	Siak	...	11

* These percentages are stated by Dr. Obach. Dr. Sherman writes: "As the percentage of Gutta in a sample of pure Gutta-percha from the species Dichopsis gutta is generally 85 to 90, it is certain that the best commercial variety is far from being pure."

The grading as here given has been changed from year to year, the names simply signifying some peculiarity of the Gutta-percha and the places from whence the different varieties are supposed to come. There is no connection whatever between the different kinds (as described commercially) and the species of the trees. This lack of connection has greatly retarded the scientific study of Gutta-percha for, when the products of two different kinds of trees are mixed, there is no known way of separating or identifying them.

A table is given of imports of Gutta-percha into Singapore for 1900, and also of the exports. Two grades are given corresponding evidently, to Gutta-percha and Gutta-jelutong (Pontianak) the totals being as follows, in pounds:

	Imports.	Exports.
Gutta-percha	$9,875,533\frac{1}{3}$	12,986,600
Inferior Gutta	$15,683,866\frac{2}{3}$	12,790,000
Total ...	25,559,400	25,776,600

These figures compare very closely with returns printed already in The India Rubber World, which has stated the export of true Gutta-percha from Singapore in 1900 at $13,684,133\frac{1}{3}$ pounds, as against 12,986,600 pounds above.

From the tables it is seen that Gutta-percha is divided by the statisticians into Gutta-percha proper and inferior Gutta, anything under an import price of $15 (Mexican per picul of $133\frac{1}{3}$ pounds) coming under the latter head. This new method of dividing the Gutta-percha into a high and low grade was devised in order to avoid the misleading figures of the Gutta-percha trade, which resulted formerly when the great quantity of inferior Gutta, which is in truth no Gutta at all, was considered a real Gutta-percha.

This grouping into real and inferior Gutta-percha gave an unique clue to the Chinese practice in Singapore, for it can be seen that 1900, for example, 23,000 more piculs (3,111,067 pounds, to be exact) more of Gutta-percha were exported than were imported, while at the same time 21,000 piculs (2,893,867 pounds) less of inferior Gutta were imported than exported. As the average price of the inferior Gutta is $4.40 per picul, and the average price of Gutta-percha $74 per picul, this work of adulteration of the real with the inferior netted some $1,500,000.

Dr. Sherman is inclined to the belief, since he visited the recognized Gutta-percha producing districts, that Gutta-percha species of value exist in important quantities in the Philippines, though up to date the most valuable species (Dichopsis gutta) has not been recognized there. But even if this species should not be found, Dr. Sherman believes that it may be introduced under cultivation, citing in support of his belief the success which has attended the experimental planting of Gutta-percha, under government auspices, in Java, to which island the true Gutta-percha is not indigenous. The Dutch government began planting Gutta-percha in 1847, as a result of which many thousands of trees have come into existence, but as they are of more value in producing seed for further planting than for their product of gum, no extraction is allowed. In view of the diminishing native supplies, the Government is now devoting serious attention tc Gutta-percha cultivation, and active steps have been taken in a program that, by 1907, will have 900,000 to 1,000,000 Gutta-percha trees planted in Java alone.

In regard to the amount of Gutta-percha secured by the natives in their careless way of working it is almost impossible to say. Their own statements are both inaccurate and wilfully misleading The experiments made by botanists and others show pretty conclusively that the amount of Gutta-percha in a tree increases with its size and age. The amounts secured by supposedly reliable witnesses vary from only a few ounces to 13½ pounds. This is not to be wondered at, as the trees felled were of all sizes and ages. One of the latest and most carefully carried out experiments by Curtis gave 1½ pounds of pure Gutta-percha, the tree being large and full grown. Most experimenters agree that the natives, from their careless methods, only get, on an average, 1 pound from each tree. These experiments naturally suggest the queries. First, what amount of Gutta-percha does a tree really contain? Second, what proportion of the total Gutta-percha in the tree can be collected by ringing the tree in the native way? Wray experimented on the large Gutta-percha tree found in the forest, with a view of throwing light on the matter. By felling and ringing the tree, native fashion, he secured about ⅗th pounds of Gutta-percha. He then analyzed the bark and leaves, computed their weight, and concluded that there had been at least 25 pounds in the entire tree. Thus, by the native method, only one-thirty-fifth to one fortieth of the entire yield can be secured. From an experiment conducted by P. Von Romburgh, on another tree, cultivated, the above figures would appear to be too large, but even if we take a perfectly

safe estimate of one-tenth as the amount secured, the fearful waste is very evident.

Many years ago it was found that the bark left on the Gutta-percha tree which has been felled by the natives and left to rot in the jungle still contained 5 per cent. of pure Gutta-percha, while the dead leaves 7 to 10 per cent. Consequently many experiments have been made in European countries, as well as in Singapore and Java, to get a working process for extracting Gutta-percha from bark and leaves. The processes thus resulting are both patented and secret, and Dr. Sherman was not permitted to examine them, but he inclines to the belief that all the Gutta-percha factories now running in the East have greatly improved their methods and machines since the beginning. The consensus of opinion seems to be that, by the time the Gutta-percha plantations are ready to furnish leaves enough, the factories will be able to produce the best grade of Gutta-percha.

To sum up, Dr. Sherman believes, after visiting the Gutta-percha regions already exploited, that the Phillippines contain Gutta-percha species of value. If the best species is not to be found native, the conditions are favourable for its introduction. A supply from plantations may be a long time coming, but the Philippines will be equally situated with other countries, when the native supplies have become exhausted and plantations of Gutta-percha are the only dependence. And by the time plantations are matured, the work of chemists will have provided means for obtaining a steady annual yield of Gutta without injury to the tree.

Gutta Percha Exports from Sarawak.

There is a growing output of Gutta-percha from the British protectorate of Sarawak, of which Kuching is the capital, on the western coast of Borneo, and which has an area equal to that of Illinois, in the United States. According to Dr. Obach, the exports of Gutta-percha for the five years ended 1896 were 1,593,984 pounds, an annual average of 318, 797 pounds of the average export value of 35½ cents. The last report of the British consul in Sarawak contains data from which this table has been compiled, giving the weight of yearly exports in piculs, and value in English money, with equivalent weights in pounds and value in American money:

Years	Piculs	£	Pounds	Cents
1897	2,867	18,553	382,266⅔	23⅔
1898	3,745	27,573	499,350	26⅞
1899	8,980	56,562	1,197,333⅛	23
1900	7,964	78,829	1,061,866⅔	36⅛

Gutta-percha is gathered by the native Dyaks, who can be hired for 7 pence per day. The trading is chiefly in the hands of Chinese. Some of the best Gutta-percha known to commerce comes from Sarawak, but there is also included much "Sarawak mixed," which Obach describes as "a very useful second class material." The average export value, therefore, is less than for Gutta-percha from

Penang or Malacca, in the Malay Peninsula, Sarawak Gutta-percha is exported wholly to Singapore.

The India Rubber World page 137, February 1, 1902.

PLANTING IN BRITISH CENTRAL AFRICA.

Mlanji is not the most tropical district of the whole Protectorate. It is fairly low, hot and humid most of the year, while it probably gets double the average amount of rain which falls in other parts of the Shire Highlands. As a Coffee district it was perhaps not so much spoken about as that district which a certain Missionary called the home of coffee, but still much was expected from it owing to its rich soil and excellent rainfall. Unfortunately, it has suffered to some extent from a lack of labour but more from the baneful effects of Ceylon methods. When one considers the matter one cannot help coming to the conclusion that Ceylon methods, so much vaunted in their tight little island, have been the ruin of many a young planter, and have nearly proved the ruin of our young industry here.

Happily, however, things appear to be brightening up and just when planters most needed some heartening. Mr. BROWN after trying his best to produce coffee on the old Ceylon plan of clearing the forest, with its ruinous waste of timber, soil and humus, has been turning his attention, like most of us, to shade. He has been experimenting with indigenous shade, has, in fact, planted coffee in the natural forest. Nowhere else but in Mlanji could you plant coffee under forest shade for the simple reason that all the other districts have woods, but Mlanji occupies the enviable position of possessing decent forest. The trees in Mr. BROWN s shade clearing are on an average, fifty feet high and very few trees were felled when the clearing was made. The coffee is now three years in the ground and is on an average six feet high. One of the primaries which was measured by the writer was certainly five feet three inches long, and on going through the parts where the shade is thickest one has to force one's way by pushing aside the interlocking branches. The strange thing is that wherever there is a break in the forest and no shade available the coffee is extremely poor, and that the coffee is best where the shade is thickest. But the strangest thing of all to most people is the fact that the trees at present have a crop on them varying from three to eight cwts. I might put the figure higher as a maximum but it is best to be safe. In a month or two the crop will have matured sufficiently to be quite certain of its quality, but at present there is not the slightest evidence of unsoundness of bean. Last year the maiden crop was lost by a bad attack of thrips but with the favourable blossoming season which has prevailed this year the crop so far has had every chance, and if only it comes to maturity it will be a striking proof of what coffee can do under shade. It is a pleasure to be able to congratulate Mr. HENRY BROWN, after all his efforts, on having reached success at last, and we sincerely hope that the brilliant promise of the present will be fulfilled.

Mr. BROWN'S place is not the only one which is looking well at Mlanji, El Dorado, Mr. ROBINS' new estate, is also looking extremely well, and is carrying a good crop. Shade is being got up as fast as possible and Mr. ROBINS intends to open in future under native shade. Much of his young coffee is under partial shade, and as the native Albizzias spring up very fast (self-sown) in every clearing he hopes soon to have his coffee well protected. His trees are bearing in some cases a very heavy crop and if it all comes to maturity he will be able to give his pulper some hard work to do.

Lauderdale Estate is being got under shade and is showing a very fair crop after its recent cutting back. There is evidence that shade is the factor which has been wanting at Mlanji to make coffee a complete success there, and we hope that the encouraging prospects of this year may be followed up by a steady improvment in the output from the Mlanji district. There can be no doubt as to the many natural advantages which Mlanji possesses and should the shade prove the solution of their difficulty Mlange will undoubtedly soon be the premier planting district of the Shire Highlands.

Among the other products which are being cultivated at Mlanji is tea. Cocoa of course is being tried, but as the experiment is still in its infancy it is impossible to say much about that product. Tea undoubtedly flourishes exceedingly well. *Centeral African Times.*

PARA RUBBER.

In the month of November the shipments of rubber from Para amounted to 3,141,338 kilos, of which 1,556,691 kilos, were from the State of Para, 1,435,101 from Manaos and 149,636 from Iquitos. Of this rubber, 1,489,150 kilos, were shipped to the United States, 1,448,181 to Liverpool, 182,502 to Havre and 21,205 to Hamburg.

REPORT ON GERMAN EAST AFRICA FOR THE YEAR 1900.

BY MR. A. C. HOLLIS, ACTING VICE-CONSUL.

Caoutchouc.

There are numerous sorts of caoutchouc creepers and trees indigenous to German East Africa, but the only kinds which are of value are *Landolphia Kirkii*, (Kiswahili, Mohango), and *Mascarenhasia elastica*, (Kiswahili, Mgora). Until quite lately it was believed that the best rubber was the product of *Landolphia florida var. Comorensis* (Kiswahili, Mbungo), but it has now been proved that this creeper is practically worthless.

Samples of the milky juice of the wild fig tree have been sent to Europe on several occasions, but the price obtained has always been so low as not to repay the cost of transport.

L. Kirkii is principally found in the Kilwa, Lindi, Mahenge, Songea and Langenburg districts; a little also comes from the hinterland of Dar-es-Salaam, Tanga, Pangani and Bagamoyo, and from Bismarckburg, Mpapua and Tabora. A certain amount brought from Portuguese territory finds its way to the port of Mikindani.

Mascarenhasia elastica known in the trade as Mgoa rubber, is only found south of Dar-es-Salaam.

Several trials have been made with other kinds of rubber. *Hevea Brasiliensis* (Para rubber) has been planted repeatedly, but without success, the climate being too dry. *Ficus elastica, L. Madagascariensis,* and an *Euphorbia* sp. (from Madagascar) have done fairly well. *Castilloa elastica*, *Hancornia speciosa*, and *Willoughbeia*, were each tried once, but the seed did not germinate. *Manihot Glaziovii* (Ceara rubber) was first planted at Tanga in 1891. There are at present about 20,000 trees, but it is feared that it will not pay as the atmosphere is too moist.

It is thought probable that Ceara rubber will do better in Donde Barikiwa (Kilwa district), where a small experimental plantation has lately been opened.

The Decree which came into force on January 1st, 1898, forbidding the export of impure rubber, was altered on June 7, 1900. Such rubber, when met with, is to be confiscated by the authorities, from whom it may be purchased by responsible European merchants, who bind themselves not to sell the same as rubber of good quality.

Gutta-percha.—The *Calotropis procera*, shrub, which is often met with in the plains, is said to yield guttapercha of good quality.

Copra.—Several thousand Coco-nuts have been planted during the year under review by the German Government.

It is estimated there are over 1,500,000 palms in the colony. The export of copra has increased considerably during the last 10 years.

Gum arabic.—Gum arabic, the concrete juice which exudes from the commonest of all the acacia trees of the East African steppes (*Acacia Senegal*), is likely to form an important article of export in the near future.

Tanning plants.—The Acacia Catechu, the bark of which is exported in large quantities from India and Burmah, grows wild in most parts of the colony. Other trees which occur frequently in German East Africa, and which are much used elsewhere for tanning purposes, are Acacia Arabica, Pterocarpus erinaceus, and the mangrove.

Colouring plants.—Although plants containing colouring matter are now a days of little value, yet an examination is at present being made of the wild Indigofera, of the yellow wood of the Cardiogyne Africana, of the yellow bark of the Ochna alboserrata and the Zanthoxylon, of the red-coloured Randeia malleifera, and of the purple Cassia goratensis.

Thousands of beautifully coloured hand-made mats of plaited straw are exported yearly to Zanzibar, Arabia, and India. The

(NOTE.—*Mascarenhasia elastica* has been introduced into the Gardens in Singapore, and seems to grow remarkably well. We want to know more about the value of its rubber. The statement as to *Calotropis procera* producing gutta percha is an error. It only produces a very inferior rubber. *Ed.*)

colours used are five in number, and it may not be misplaced to record here how the natives obtain them.

Red :—A yellow root, Curcuma (Kiswahili, Manjano) found almost everywhere, is dried, stamped, and left to soak for a week in a little alum and water. This mixture is then boiled together with a red root, the Rubia Cordifolia (Kiswahili, Fua), which is imported from India, and can be purchased in every shop.

Yellow :—A piece of the bark of the Namavele acacia, called in Kiswahili, Mungamo, is pounded in a mortar and boiled with the strip of mat it is intended to colour.

Orange :—The same process is performed as with yellow, only a little curcuma is added.

Green :—The strip of mat is boiled with a concoction made up of the green leaves of Ricinus communis, Jatropha curcas, and Cordyla Africana (Kiswahili, Mche), which have previously been bruised.

Black :—Some dark-coloured slime, found in many of the rivers, is placed on the piece of mat and allowed to remain there for three days, after which it is removed. The strip is dried in the sun, and then boiled with a little pounded sorghum straw.

Medicinal plants :—Various kinds of strophanthus and strychnos are found in the plains.

Wax :—A very laudable effort is being made to establish a rational bee culture. Up to within the last year or two the wax exported from German East Africa has solely come from Portuguese territory.

Forestry-Rufiji :—The numerous rivulets and creeks, which form the mouths of the Rufiji River, and which cover an area of 100,000 acres, are lined by extensive mangrove swamps producing the timber known as *boriti* or Zanzibar rafters. This timber, which is much used for the building of native houses, is also exported to Zanzibar, Arabia, and India.

It is the opinion of various botanists that when traders, both European and native, are allowed to cut boritis at will the mangroves in course of time die out, as large numbers of big trees are usually cleared from one spot, thus exposing the young plants to the direct rays of the sun, which is said to kill them. In consequence, the only trees now to be found in various parts of the Rufiji Delta are Phoenix reclinata, Osmunda sp., and Barringtonia racemosa.

In order to preserve, and if possible, to increase the present supply of boritis, a forest officer and three wood-rangers have been stationed in the Rufiji sub-district. The trees are felled under their supervision, and the timber is sold by the German Government.

The custom of systematically stripping a part of the bark from the mangroves, as sometimes practised in the East and West Indies, is not permitted, as it is held that such a course must be injurious to the trees. After the timber has been felled, the bark is stripped and sold.

A saw-mill has been started at Saninga by a Hamburg company. The demand at Zanzibar for planks and beams is so great that the supply is inadequate. A few sleepers are also cut and sent to Mombasa for use on the Uganda Railway.

The regulations issued for the preservation of the woods in the Usambara Hills have done much to prevent the needless felling of valuable timber. Oaks, firs, and other European trees are now being planted under the auspices of the Woods and Forests Commission. Similar regulations will shortly be issued for other parts of the colony. In the meantime a ranger has been placed in charge of the customs at Moa, and non-commissioned officers, who have a knowledge of forestry, have been selected for duty at most of the stations in the interior.

PLANTING AND SCIENCE IN CEYLON.

In his address at the opening of the Legislative Council on the 18th instant, the Governor of Ceylon, the Right Hon'ble Sir JOHN WEST RIDGEWAY, remarked :—

Mr. WILLIS, the very able and energetic Director, reports that the scientific sub-department has been fully organised, and a large amount of work has been carried out by it. The chief desideratum in organization is now the further division of the sub-department of gardens into the Botanic Gardens proper, and an Experimental Garden, where large experiments may be tried with staples, or with plants that may become staples, leaving experiments on the minor plants and the cultivation of ornamental plants to the Botanic Gardens. By the purchase of Gangaroowa estate, facing the Peradeniya Gardens, an unrivalled site for experimental work has been secured, and in future all work with tea, coffee, coco-nuts, camphor, cinchona, tobacco, fibres, fruits, etc., will be carried on upon this site on a scale sufficient for the practical commercial testing of the results and products for the information of all interested in agricultural enterprise in the Colony. With the Experimental Garden it is proposed to combine the training of a few students, and thus supply the place of the Agricultural School in Colombo now closed. The training will be of a strictly practical character, and almost entirely out of doors, the garden being worked like an estate.

The general condition of the crops of the Island in regard to diseases is distinctly better than usual. This is partly due to the work of the Mycologist and Entomologist, who have done much to spread a knowledge of the principles of sanitation and of treatment of disease in its early stages among planters and others. They have reported, mainly by letter, on over 750 cases of disease during the year, and have travelled over a large area giving advice and help. They have also carried out a large amount of scientific investigation into the life histories of insects and fungi, especially those which are or may become harmful. Mr. GREEN has also devoted a good deal of attention to the question of mosquitoes and malaria, with a view to the discovery of preventive measures against this scourge.

With the view of obstructing as much as possible the introduction of diease into the Island, an Ordinance has been passed empowering the Government to prohibit the importation of plants from infected countries, or to require them to be fumigated on arrival, according to the necessities of the case. A small fumigating chamber is about to be built at Kochchikada for the treatment of imports.

Tea has passed through a critical period. The year 1900 was distinguished by an unusually favourable season for heavy flushing in most of the Ceylon tea districts, and there appeared also to be a prevalent belief that common teas were likely to find a good market. The result was a total of shipments far in excess of the estimate, no less than 149,264,602 lbs., or 19½ million pounds above the exports in 1899. This heavy increase, more especially in tea of poor quality, combined with large shipments from India, led to a rapid fall in the average price, until towards the end of the year and during the first half of the present year it approached a figure that could leave little or no margin of profit to a certain proportion of the producers. For a time production had overtaken consumption, checked as the latter undoubtedly was, to some extent, in the United Kingdom, by the Imperial War Tax of two pence additional per pound on our staple; and with large stocks the prospect before Ceylon and Indian planters was at the opening of the present year by no means bright. But the planters of Ceylon, as in former crises, rose to the occasion, and by plucking finer leaf and preparing a better quality of tea have gradually circumscribed shipments and established a standard for which a much better and improving average price is now offered in the London market. The prospect then, at the present moment, is by no means unfavourable to the Ceylon tea planter Let us hope that the lesson has not been lost, and that he has learned how shortsighted it is to rush the home market with large quantities of common tea, and how much wiser it is to endeavour, as far as possible, to make tea of good quality. Any extension of planting being for the present stopped, it is improbable requirements of home and foreign markets. Further, let us hope for an early termination to the troubles in South Africa and for the consequent removal of the war levy on tea, followed by a better progressive rate of consumption in the United Kingdom. In regard to foreign markets, the progress made more especially in Russia—continues to be satisfactory, and there is good reason to believe that the manufacture of pure green tea to suit the American market will benefit the local industry. The record for the six years so far as available may be given as follows:—

		Increase on previous year.
1896 - -	108,141,412 lbs. -	- 10,000,000 lbs.
1897 - -	116,054,567 „ -	- 8,000,000 „
1898 - -	119,769,071 „ -	- 3,700,000 „
1899 - -	129,894,156 „ -	- 10,000,000 „
1900 - -	149,264,602 „ -	- 19,500,000 „
1901 (Estimate)	146,000,000 „ -	- Decrease.

The progress in shipment to countries other than the United Kingdom may be noted.

Exports of Tea from Ceylon to the following countries:—

	Australasia.	Russia.	All Countries outside United Kingdom.
	lbs.	lbs.	lbs.
1896 - -	11,062,832	201,313	14,205,051
1897 - -	13,258,456	439,349	17,124,508
1898 - -	15,126,891	2,714,003	23,635,138
1899 - -	15,606,833	3,949,740	25,946,032
1900 - -	17,606,912	8,917,185	34,671,446
1901 - -	15,342,156	6,959,327	28,857,783

Colombo is clearly destined to become a great market and distributing port for tea. How far its trade and importance might be increased by the removal of certain restrictions, and the imposition of safeguards against the import and export of what is known as "rubbishy" tea it is for those chiefly concerned to say. Meantime, confidently trusting in the judicious management of plantations, practical experience being aided by science, I see no reason to doubt the continued well-being of the great planting industry of the Colony.

Cacao is doing well, and on most large estates the canker has been largely eradicated. Coco-nuts, cinnamon, cardamoms and other smaller products have been in a prosperous condition during the year.

Of new products, rubber claims the first place. Exports of appreciable quantities have commenced, and the prices obtained have been most satisfactory. The latest market report contains the entry "Best Para 3*s.* 9*d.*, Ceylon, fine Para, sorts, 4*s.* 1¾*d.* per lb." This cultivation may now be considered established in the wet low-country districts.

Camphor has continued to attract attention, and bids fair to prove a paying minor product for many parts of the South-west and the hills. Samples prepared from trees grown in the Botanic Gardens have lately been valued at 126*s.* per cwt. The yield of camphor from clippings of leaves and young twigs is about 12 per cent. and the preparation is cheap, so that in places where 16,000 lbs. of clippings can be obtained from an acre in a year, there is little doubt that it will pay well.

Of other minor or new products, tobacco continues to extend, also vanilla, pepper, cinchona and tapioca; the roots of the last named are, however, only used as yams, and not for the preparation of tapioca. Citronella Oil is in a very depressed state, owing to overproduction and too low prices, with new competition in unadulterated oil from Java. The adulteration of our oils is so wholesale and so shameless that it is difficult to foresee any remedy for the depression, unless the cultivation be taken up by large manufacturers. A detailed investigation has been made, and a report will soon be published.

Investigations are being made into the Ceylon Gutta-perchas, ebonies and other subjects. The Laboratory here has been used by numerous visitors, in addition to the staff of the Department. A scientific Journal, the "Annals of the Royal Botanic Gardens, Peradeniya," has been established for the publication of the technical and scientific part of the work of the Department. The subordinate clerical and gardening staff has been re-organized with an incremental system of pay, resulting in a slight saving. The Department has assisted the Department of Public Instruction in the starting of the new system of School Gardens, providing numbers of useful plants of the best varieties.

NOTES.

New Rubber in Saigon.

A new source of supply for rubber has been found out by M. Deiss, a French scientist at Saigon. The forests inland in that quarter abound with lianas, creeping and twining plants which grow to a large size. These lianas yield rubber out of the juice from cutting in the bark (the usual mode of gathering) but not in paying quantities. The fact that the bark, apart from the juice, holds rubber, had long been known; but nothing had been done to turn this knowledge to profitable account. M. Deiss was struck by this, and sought for means to get at the stores of rubber in the bark. It is said that he has met with success. The bark is treated chemically, and undergoes sundry processes, including treatment by currents of hot and cold water alternately. The result is said to be the extraction of rubber of the best quality, which soon thickens and hardens. It took repeated experiments to show the right way to go to work. The outcome is that a syndicate of capitalists in France has undertaken to start in Cochin China and Tonquin, works for turning out rubber from bark on the new system.

Rubber and the State in Brazil.

The Bulletin de la Societe d' Etudes Coloniales (Brussels) recently published the results of an official inquiry made under the direction of the Belgian ministry of foreign affairs as to the official measures taken in Brazil to foster its greater rubber industry. It was found that the general government of the republic has passed no laws relating to the industry. It is not regulated at all except so far as the legislature of the several states have adopted measures. Seventeen of the twenty states produce rubber, the climate being unfavourable to rubber culture only in the three southern states of Rio Grande do Sul, Santa Catharina, and Parana. Most of the small Atlantic coast states in the rubber zone, though producing more or less caoutchouc, have made no attempt, as yet, to conserve their rubber resources or to encourage or regulate its production. These states include Rio de Janeiro, Minas Geraes, Espirito Santo, Parahyba, Rio Grande do Norte, Sergipe, and Ceara. Most of the rubber states make the product contributed to the finances by imposing a tax on rubber exports, but the states

above mentioned have not given even this attention to the industry except Minas Geraes which collects an export duty of 4 per cent. *ad valorem.* In these seven states the first comer may harvest the crop wherever he may find it on the public domain.

On the other hand, the state of Para from which by far the largest shipments are made, encourages the planting of caoutchouc by offering a premium of 1,000,000 reis, or over $1,000 for every 2,000 trees that are properly planted. This law, which has been in force only four years, is already stimulating the the development of rubber plantations and its wisdom is being conclusively demonstrated. This large state, which embraces all the lower part of the Amazon and some of its mightiest tributaries will not have to rely, in the coming years, upon supplies that grow wild in the forests; in fact, no source of rubber so freely tapped as that in Para can be relied upon indefinitely to yield an unfailing supply. The days of exhaustion will come just as they have overtaken the rubber vines of West Africa, which have all been killed for many miles inland from the coast. The only way to supply the future demand will be to increase the quantity, and that can be done only by rubber planting, which, in a few decades, will revolutionize the business The world now depends almost solely upon the wild sources of supply, but there will be a great deal of plantation rubber in the market before the century now beginning is very far advanced.

The State of Sao Paulo also offers a handsome premium for the development of rubber plantations, and both these states impose a comparatively heavy tax upon the exports of rubber with the wise intention of devoting a considerable part of the receipts fo the conservation and encouragement of the industry. Matto Grosso, under the law of 1898, offers special facilities for the acquirement of a fixed quantity of rubber lands by those who discover them in the vast part of the public domain that is still unexplored. Amazonas and Bahia are not yet offering special inducements for rubber planting, but the land laws, adopted by these states in 1897, facilitate private ownership in rubber forests and this is a long step toward establishing the industry on a stable basis.

All these improvements in the status of the rubber industry of Brazil have been made within the past four years, They encourage the belief that this great source of wealth will come, more and more, to be managed scientifically in the interest of Brazil and of the world and the great advantage of the investors of capital.

Gutta Percha in New Guinea.

For some years there has been a report that Gutta-percha of good quality had been found wild in German New Guinea, and the German Government naturally much interested in this matter, offered a large reward for its discovery. As early as November 1895, Professor Engler described in the Notiz-blatt des Konigl, Bot. Gart. und Mus zu Berlin No. 3. p. 101, four plants from King Wilhelm's Land, where the following names are applied to the product. Getah Susu (*Palaquium Susu* Engl) the best kind, Getah Maran (*Payena Bawun* Scheff) Getah Natu (*Payena Mentzelii* K.

Sch.) and Getah Malu (*Sideroxylon kaernbachianum* Engler). "It is stated that the milky juice of 1, 3, 4 is white, while the cotyledons of No. 2 turn red on exposure to the air. It may therefore be supposed that the product turns reddish like the Getah Taban Merah, of the Malays" (Pharm, Journ.)

It will be noticed that the native names are all Malay, not Papuan words and consequently would be received with suspicion. From that time nothing more was heard of Papuan Gutta Percha for some years, though I was shewn in Singapore some three or four years ago a sample of first class Gutta percha said to have been obtained in New Guinea. The distribution of the true Gutta producing trees is so limited that to find some in New Guinea was quite unexpected. Gutta percha of a kind occurs as far north as Siam and here and there among the further islands of the Archipelago, but it is practically worthless. The Malay peninsula, Sumatra Borneo and the Islands just around are the home of the true Taban Merah. I have just received however a letter from Mr. R. Schlechter, from German New Guinea who states that he has just discovered any quantity of a new species which is allied to *Dichopsis Gutta* and produces a Gutta exactly like Getah Taban Merah in every respect. This important discovery coming just now when the supply of this product is far below the demand may prove a great stimulus in opening up this most troublesome and difficult country.

Circular to Employers of Indian Labour.

The following circular will be read with interest by many planters and other employers of labour in the Straits.

The following correspondence regarding the prosecution by the Superintendent, Straits Emigration Depôt, of certain police and boatmen in Negapatam for extorting money from Kanganies and coolies is circulated for the information of Employers of Labour.

2. The attention of Employers of Labour is invited to the latter part of paragraph 6 of Dr. Foston's letter No. 110/02 of the 18th February, 1902.

D. H. WISE,

Secretary to Resident-General, F.M.S.

Resident-General's Office, 5th March, 1902.

S.S. Emigration Office,

Negapatam, 18th February, 1902.

The Resident-General,
Federated Malay States,
Kuala Lumpur, Selangor.

Sir,—On the 25th November, 1901, Kangany Kadirvalu, belonging to Damansara Estate, Selangor, brought ten coolies and one minor and applied to me for aided tickets. The minor, a lad of ten years, told me he was going across with the knowledge and consent of his parents.

2. The Kangany was given the usual orders for tickets and he took his coolies away to a neighbouring village, "Puthur," for detention till departure of steamer.

3. The same evening Kadirvalu came to my quarters and reported that two policemen on beat had taken away his license and had been harassing him and his coolies. The matter was at once reported to the Police at Negapatam, and Kadirvalu, accompanied by my peon and a police constable, went to the village and returned with the license, which had been left behind by the constables before they continued their rounds. It was was further ascertained that they had extorted eight annas from a relative of the lad named Adikan after frightening the cooly that he would be arrested for crimping away a minor.

4. The next day, in company with the Inspector of Police at Negapatam, I went over to Sikkil, the head-quarters of these policemen, and there Kadirvalu and his cooly identified the two men. They were prosecuted before the Stationary Sub-Magistrate, who found them guilty and sentenced them to a fine of fifty rupees each, in default, six weeks' imprisonment.

5. After the usual period allowed by the law, the prisoners appealed to the Joint Magistrate (the Sub-Collector) against the Sub-Magistrate's conviction, but the sentence was confirmed in the higher court.

6. It is to be hoped, after this, that the subordinate police officials in the neighbourhood will cease troubling Kanganies who take up residence in the villages pending the departure of the steamer. Kanganies, however, must help me by remaining behind until their evidence has been taken before a court of law, for, otherwise, I can do no good by merely making a complaint. The witnesses must be present to substantiate their charge. Every endeavour will be made to get them away as soon as practicable.

I have, etc.,

E. FOSTON,

Superintendent, S.S. Emigration Depôt.

S.S. EMIGRATION OFFICE,

Negapatam, 18th February, 1902.

The Resident-General,
Federated Malay States,
Kuala Lumpur, Selangor.

Sir,—I have the honour to report that, by the s.s. "Bulimba," on the 23rd December, 1901, Kangany Suppiah, of Linggi Estate, Negri Sembilan, together with an assistant, arrived in Negapatam, and the next morning they reported themselves to me. Suppiah complained that although he paid for the landing charge *at Negapatam* to the British India Agents when be purchased his passage tickets *in Penang*, yet, between the steamer and the shore here, their boat was stopped and, after knocking them and other passengers about, the boatman robbed them of eight annas apiece.

They further complained that, after paying the usual harbour dues on landing, a man with a badge detained their boxes until they had paid four annas each.

2. The trouble about the boatmen is a long-standing grievance on the part of returning emigrants at this port, and, as the present complaint seemed suitable for enquiry, I persuaded Suppiah and his man to remain at Negapatam, the Madura Company offering to pay all their expenses.

3. The case against the second accused was heard first by the Stationary Sub-Magistrate and he was sentenced to two months' rigorous imprisonment; and the boatman was placed before the Joint Magistrate and was sent to jail for six months.

I have, etc.,

E. FOSTON,

Superintendent, S.S. Emigration Depôt.

RESIDENT-GENERAL'S OFFICE,

1st March, 1902.

To the Superintendent,
S.S. Emigration Depôt,
Negapatam.

Sir,—I have the honour to acknowledge the receipt of your letters I.E. 110 and 111 of 18th February ultimo, reporting the successful action taken by you in obtaining convictions of police, boatmen and others for illegal interference with recruiting Kanganies.

On behalf of the Government and of the Employers of Labour in the Federated Malay States, I beg to tender you my hearty thanks for your energetic action.

I am having copies of your letters printed for circulation to the Residents, to Protectors of Labour and to Planting Associations.

I have, etc.,

W. H. TREACHER,

Resident-General, F.M.S.

Personal Note.

The Director of Gardens and Forests, Mr. H. N. RIDLEY, returned to Singapore on March 15th and Mr. W. FOX, Assistant Superintendent left for a year's leave on March 24th.

SINGAPORE MARKET REPORT.

February, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	30.00	30.00
Bali	...	27.00	27.00
Liberian	167	19.50	18.75
Copra	1,061	10.80	9.75
Gambier	1,910	11.80	11.25
Cube Gambier, Nos. 1 & 2	165	17.50	14.50
Gutta Percha, 1st quality	...	500.00	350.00
Medium	...	450.00	200.00
Lower	...	200.00	50.00
Borneo Rubber	...	130.00	67.00
Gutta Jelutong	...	7.00	6.50
Nutmegs, No. 1	...	53.00	51.00
No. 2	...	70.00	70.00
Mace, Banda	...	105.00	85.00
Amboyna	...	70.00	70.00
Pepper, Black	1,062	30.62½	29.75
White	75	54.50	53.00
Pearl Sago, Fair	60	4.90	4.45
Medium	...	5.00	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	2,450	3.70	3.50
No. 2	175	3.45	1.90
Flake Tapioca, Small	490	8.30	5.25
Medium	23	6.00	5.25
Pearl Tapioca, Small	205	6.25	5.00
Medium	720	7.75	5.40
Bullet	...	6.50	6.00
Tin	3,575	71.25	65.50

London Market.

Castor Oil.—There is almost an entire absence of fresh features in the castor oil market. Good seconds Calcutta is still quoted at $3\frac{1}{16}d.$ to $3\frac{1}{8}d.$ per lb., and first pressure French can still be bought at $2\frac{15}{16}d.$ to $3d.$, second pressure $2\frac{7}{8}d.$ per lb. In the forward positions the Calcutta market has taken a slightly firmer tone, and French is still maintained at the higher figures recently quoted.

Chillies. (Sierra Leone)—Forty bags new crop at auction realised 45*s.* per cwt.

Ipecacuanha.—After the auction last week further business was done in Cartagena description, including grey root at 4*s.* 4*d.*

per lb., and fair at 4s. 6d. Several holders of Cartagena root are now asking higher prices, as there has been a better demand for the United States of late. Rio is moving off slowly, and for selected bales 10s. 5d. to 10s. 6d. is asked.

Guarana.—A little is obtainable at 3s. per lb., the article remaining scarce.

Arrowroot.—It is reported that a syndicate has been formed in St. Vincent among the growers of arrowroot, with the idea of obtaining more remunerative prices than those prevailing for some years past. At auction fine St. Vincent was bought in at 2½d. per lb., Queensland at 1⅛d. and Bermuda at 1s. 6d. per lb.

Benzoin.—There has been a fair demand for Sumatra benzoin at from £6 per cwt. and upwards. A quantity of Palembang ex auctions has also been sold at from 41s. to 42s. 6d. for good seconds.

Spices.—The dull tone of this market still continues, buyers showing little disposition to purchase. At auction on Wednesday Cochin Ginger was lower, a parcel of new crop washed rough being sold at 39s. to 41s. per cwt., good bright boldish Calicut was bought in at 48s. per cwt. Jamaica, in good supply, met with no demand, only a few unimportant lots, dull lean at 37s., middling dull at 41s. 6d., and middling washed at 45s. per cwt. Zanzibar Cloves rather firmer, barely fair quality was bought in at 4d. per lb. The quotation for March-May delivery is 3⅞d. and for June-August 4d. per lb. Fair Penang sold at 7d. and good at 8½d. per lb. Ordinany stalky Zanzibar Chillies were bought in at 35s. per cwt. Fine long red picked Japan were also withdrawn, no bid being made. Pimento easier; a fair proportion sold at 2⅝d. per lb. for common, and at 2¾d. for ordinary, fair quality being bought in at 2⅞d. per lb. Mace was bought in at 1s. 8d. per lb. for middling red Penang. Pepper very quiet, but unchanged. Penang black was bought in at 5¾d. to 6d. per lb. and greyish Alleppy at 5¾d. Singapore is quoted at 5 15/16d. per lb. for spot and arrival. Singapore white was bought in at 10⅛d. per lb. for good fair.

The Chemist and Druggist, March 1, 1902.

Coffee.

The London Commercial Record says:—There are no changes of importance to record in this market. Fresh arrivals of new crop East India to a moderate extent have been offered at auction, and for good qualities there was fair competition at steady to very full price but there is still a considerable proportion of unattractive samples and this remains difficult of sale. Good ordinary Jamaica is barely steady, but the better grades are firm. Colory Costa Rica in good demand at previous rates. Colombian has chiefly consisted of damaged parcels which are rather easier. The market for "future" has been firmer in the last few days, and closing

prices show some improvement for the week. Yesterday business was done in Santos, May at 30*s.* 9*d.* to 31*s.*, September at 31*s.* 10½*d.* to 32*s.* 3*d.* and December at 32*s.* 9*d.* to 33*s.* 1½*d.* per cwt. To-day's auction supplies embraced:—1 cask, 1 tierce, 4 barrels, Ceylon Plantation, 322 bags East India, 21 half-frazils Mocha, 137 barrels, 76 bags Jamaica, 13 bags Trinidad, 27 bags Haiti, 91 bags Colombian, 193 bags Nyassaland, 38 bags New Granada, 737 bags Costa Rica, 33 bags Mexican, 11 bags Guatemala, and 140 bags Santos, quay terms. The sales went off quietly and prices ruled somwhat in buyers' favour. A cable from Messrs. PINTO & CO. estimates the receipts from February to June inclusive, at 3,800,000 to 4,000,000 bags and the next Rio and Santos crop at 9,000,000 bags. We qnote:—

London	- Santos -	- March delivery	... 30*s.* 6*d.*
New York	- No. 7 Rio -	„	... 5.40 cts.
Hamburg	- Santos -	- „	... 30¾ pf.
Havre	- Santos -	- „	... 37 francs.

14th February, 1902.

Singapore.

Abstract of Meteorological Readings for February, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·990	145·1	77·3	86·0	69·5	16·5	74·1	·772	71·8	76	N. E.	8·78	5·62

K. K. Hospital Observatory,
Singapore, 21st March, 1902

A. B. LEICESTER,

Assistant Surgeon and Meteorological Observer.

Penang.

Abstract of Meteorological Readings for February, 1902.

District.	Mean Barometerical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		ins.	ins.
Prison Observatory	29·938	143.8	80·2	90·1	72·1	18·0	74·5	·745	69·0	66	N.W.	2·68	1·19

Penang, 7th March, 1902.

G. D. FREER,

Acting Colonial Surgeon, Penang.

Malacca.

Abstract of Meteorological Readings for February, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		ins.	ins.
General Hospital.	29·859	151·2		88·8	68·1	20·7	80·3	1·022	50·3	91	N.	6·53	5·60

Malacca, 14th March, 1902.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet.	Vapour Tension.	Humidity.		
Taiping ...	147·73	82·04	92	69	23	75·97	·818	75	9·46	2·68
Kuala Kangsar ...	...	81·41	93	67	26	74·32	·755	71	5·51	2·23
Batu Gajah ...	152·10	81·05	94	69	25	75·75	·820	77	7·13	2·51
Gopeng ...	...	80·83	92	64	28	75·18	·797	75	8·98	4·40
Ipoh ...	...	81·31	95	68	27	75·09	·790	74	4·72	2·45
Kampar ...	...	...	91	67	24	...	...	...	13·46	3·69
Teluk Anson ...	...	81·12	91	69	22	75·86	·823	78	7·05	5·90
Tapah ...	..	80·54	92	65	27	75·25	·806	77	8·69	3·40
Parit Buntar ...	...	81·55	93	68	25	75·00	·782	73	3·65	2·73
Bagan Serai ...	...	81·26	90	67	23	75·45	·804	75	7·17	3·87
Selama ...	...	81·84	92	68	24	75·78	·812	75	5·95	2·20

State Surgeon's Office,
Taiping, 10th March, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·885	152·6	80·8	90·3	70·7	19·6	75·9	0·801	72·6	77	Calm	10·24	4·96
Pudoh Gaol Hospital ,,	...	...	...	...	...	..	...	...	...	...	...	8·01	4·54
District Hospital ,,	...	...	...	...	...	...	...	...	...	...	...	9·43	4·50
,, Klang	...	...	...	85·9	73·0	12·9	...	...	...	...	...	7·69	4·16
,, Kuala Langat	...	...	...	87·2	74·4	12·8	...	...	...	...	...	3·83	2·06
,, Kuala Selangor	...	...	...	86·2	74·6	11.6	...	...	...	...	...	3·47	1·50
,, Kajang	...	...	...	84·1	73·5	10·6	...	...	...	...	...	5·59	2·34
,, Kuala Kubu	...	...	...	90·4	71·0	19·4	...	...	...	...	...	7·70	4.40
,, Serendah	...	...	...	89·0	75·7	13·3	...	...	...	...	...	8·03	4·33
,, Rawang	...	...	...	85·7	72·7	13·0	...	...	...	...	...	9·01	3·28
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	4·58	3.41

State Surgeon's Office,
Kuala Lumpur, 12th March, 1902.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for February, 1901.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, Genrl. Hospital	...	...	...	·87	·70	10.9	...	...	...	...	...	3·02	.84
Kuantan - - -	...	...	...	·83	·70	.13	...	...	...	...	...	2·64	1·07
Temerloh - - -	...	...	...	·91	·70	.21	...	...	...	...	...	1·98	1·60

RESIDENCY SURGEON'S OFFICE,
Kuala Lipis, 12th March, 1902.

P. N. GERRARD, M. D.,
Acting Residency Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for February, 1902.

District.	Mean Barometical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension..	Dew point.	Humidity.			
Lanadron Estate.			.82	88·5	68.5	20	71				N. E.	10.21	4.48

Muar, 5th March, 1902.

FRANCIS PEARS.

No. 8.] MAY, 1902. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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AT THE GOVERNMENT PRINTING OFFICE.

NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor Wyndham R. Dunstan, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

No. 8.] MAY, 1902. [Vol. I.

THE TIMBERS OF THE MALAY PENINSULA.

Concluded.

Coniferæ.

There are but few species of this order here, and as most are natives of the hill regions, they rarely are used for timber.

Dacrydium elatum, Wall. Ru Bukit.

A very large tree attaining a height of 80 or more feet. Bark ¼ inch thick.

Wood moderately hard, pale brown with fairly distinct rings somewhat irregular, fine grained, fairly heavy. Rays invisible. Weight 39 lbs. 3 ozs. to 42 lbs. 4 ozs.

Occurs on the hills of Penang and the main range.

Agathis loranthifolia, Salisb.

A very large tree, with broad coriaceous leaves, fruit a cone. Growth rather slow. Occurs in the hills of Penang and Perak.

Wood pale yellowish brown, rather light, fine grained, rings distant narrow rather darker than surrounding tissue, about 12 to an inch, rays fine, wood cells longitudinally striate.

Produces a large quantity of turpentine, Damar minyak.

Podocarpus neglecta, Bl. S'tada.

A tree of no great size, with flaky bark and narrow coriaceous leaves, common near the sea. Height about 20 feet, diameter 1½ feet. Wood fawn-white fine grained, fairly heavy and hard with irregular rings. Weight 43 lbs. 3 ozs. to 48 lbs.

Useful for axles of carts, &c.

P. cupressina, Br.

A fairly large tree, occurring on the hills in the main chain at an altitude of 2,000 feet and upwards, leaves narrow and short on the older branches minute lanceolate, on the younger ones linear spreading. Wood rather light yellow, with fine rays a fine grained and pretty wood, rings very obscure.

Weight 32 lbs. 6 oz. to 36 lbs. 3 ozs.

P. sp. A very large species attaining a height of 80 to 100 feet with a straight smooth trunk, and larger leaves than those of *P.*

neglecta, Bl., occurs in the hills in Johor at an altitude of 1,500 feet.

MONOCOTYLEDONES.

Dracæna granulata, Hook, fil.?

A tree about 30 feet tall 6 inches through with narrow grassy leaves, bark thin light coloured brownish white longitudinally wrinkled. Wood white and soft, rings irregular fine, bundles very close with very little intermediate tissue. I have some doubt as to the species of this. If not *D. granulata* it is an undescribed species.

D. aurantiaca, Wall.

A smaller shrub with marbled leaves, has wood of similar structure but the fibres are rather larger.

PALMÆ.

Of the erect palms native of the Peninsula we have a number of slender species belonging to the genera *Pinanga, Iguanura,* which are only useful for walking sticks. The best of all these is the Kerintin *Drymophloeus Singaporianus,* an elegant tufted palm with fine feathery fronds, occurring from Singapore to the Dindings. The stems of this are about 6 feet long and an inch or more through, and when cleaned are deep black with regular joints, forming beautiful walking sticks. The "Penang Lawyers", formerly popular walking sticks were made from the stems of *Licualas,* "Palas" specially *L. paludosa* and *L. acutifida.*

The leaves of some Palms are used for roofing in place of Ataps. The best of these are Sago, *Sagus laevis* and *Rumphii,* "Rumbiya", the Licualas (Palas,) Nipa and the rare palm *Teysmannia altifrons* "Daun Payoh", "Daun Sang", and those of *Zalacca Blumeana* and a few others are also used.

The fibre from the sheaths of *Arenga saccharifera* "Kabong", Tali Ijok, giving the black rope, and vegetable horsehair, is well enough known. The soft tomentum on the stems of *Caryota mitis* Lour "Tukus" is used by the Sakais as wadding in their blowpipes, and as tinder. A kind of Sago is made from the pithy tem of the same plant.

The inner part of the midrib of the leaf of the Sago palms. can be used as cork or pith, for hats, insect boxes and such purposes. The leaf must be full grown and carefully dried, when the outside is cut off with a sharp knife, and the pith cut into slices.

The rattans belong to the genera *Calamus, Dæmonorops, Korthalsia, Ceratolobus, Myrialepis,* and *Plectocomia.* They will be treated of in another number. Chicks and screens are made from the leaf rachis of the Bertam, *Eugeissona tristis* Griff.

Of woods for construction purposes, the most important is the Nibong, *Oncosperma filamentosa,* Bl. a tall tufted palm, stems about 40 feet, covered with sharp black spines, leaves long, feathery, arched with the leaflets deflexed. This palm is very abundant in damp spots near rivers, etc. The outer wood is black or dark brown and very hard. It is used for buildings, for flooring, partitions, etc. It is durable, and lasts a long time even in water.

Nibong wood is also used for spears, and such like instruments.
The closely allied Bayas, *Oncosperma horrida*, Bl. is distinguished at sight by its leaflets not being deflexed but spreading and its larger fruit. It has much softer useless wood.

The trunks of the big fan palms *Livistona Kingii*, "Serdang" and *Pholidocarpus macrocarpa*, Kupau, being very hard outside are used for piles for wharfs, as they resist the water for a long time. The trees attain a great height, about 80 feet, with smooth trunks, about 6 or 8 inches through. As in most palms, the outside of the trunk is the hard part, the inner portion being soft and pithy. The stems are very heavy and the hard wood very dark in colour.

The outer portion of the stem of *Arenga* is very hard and durable also, and in some places the trunk is split and the soft parts scooped out, and the hard portion used for water conduits.

The stems of the Betel-nut *Areca catechu*, L. are valued for fishing stakes.

PANDANEÆ.

The leaves of several of the larger Pandans are used for roofing, mats, and such like work.

Pandanus atrocarpus Griff. "Mengkuang".

A very large species attaining a height of 40 feet with very long leaves, fruit dark brown, in cylindrical heads, 7 on a raceme, is perhaps the most important species. The leaves are used for coverings of ox carts (Kajangs) matting, and hats. There is a regular demand for the leaves and many natives make a living by cutting and drying them and working them up.

P. fascicularis, "Pandan Duri".

A shorter bushy pandan with narrower leaves and large globose heads of fruits, orange or red in colour, is abundant along the sea coast and is also commonly cultivated near villages for its leaves. These are used for all the finer class of matting and baskets, cigarette cases and such work and also for roofing (ataps). The leaves after collecting are prepared by cutting off the thorny edges, and dried. For attaps they are merely folded over a stick and sewn with a short slip of rattan. For matting they are cut into slips of the required width.

GRAMINEÆ.

The only group of importance as timber, etc. is that of the Bamboos (*Bambuseæ*).

The wild Bamboos here are not very numerous, but there are patches of Bamboo forest here and there in the Peninsula especially on the upper parts of the hills in Selangor and Perak. The greater number of the indigenous species are small or slender, often scandent kinds. Several introduced species are cultivated or have been planted in various places, and remain long after cultivation has been abandoned.

The Bamboo forests of the interior chiefly consist of *Oxytenan-*

thera sinuata Gamble. Bulu minyak : *Schizostachyum latifolium* Gamble and *S. aciculare*, Gamble, and *Gigantochloa latispiculata*, Gamble, Buluh Tilan minyak. All are slender and small bamboos, collected for basket work, etc. Of the larger kinds we have in Perak and Pahang *Dendrocalamus giganteus*, Munro, the biggest known species, attaining a diameter of seven inches and used for pots or cups and many other household articles.

D. strictus, Nees.

The male bamboo with solid stems is only cultivated here. It could be extensively grown as it grows rapidly and well. The stems are used for spear handles, heads of polo-clubs and many such purposes. It is readily propagated from cuttings of the stem and grows fast in damp soil.

D. flagellifer Munro. Buluh Betong.

A tall bamboo with long arching stems, and long whip like branches of the panicle, is common in cultivation in Singapore being one of the Bamboos grown for the eatable shoots. It is also used for carrying sticks, and other work for which bamboo is required.

H. N. RIDLEY.

Report on experiments conducted by the Factory Engineer, Selangor, on the steaming qualities Casuarina, Bakau, and ordinary firewood.

The trials were carried out under the following circumstances :—

A steam Roller was sent out to work on the ordinary rolling of Macadamized roads and with it an Apprentice in addition to the Staff of Driver and Steerman, who kept a record of the number of hours the engine ran, the Steam pressure maintained, the number of pieces of firewood used and various other data.

The following is the result :—

1. The first trial was made with Casuarina on the 10th October when the roller took out 1,098 pieces, weighing 5,983 lbs. The firewood was consumed after working 105½ hours with the following result :—

(*a*) Consumption of wood per hour, in lbs., 56·44.
(*b*) Consumption of wood per hour, in cubic feet 1·22.
(*c*) Average time to get 50 lbs. steam from cold water, 2 hours.
(*d*) Average steam pressure during 105½ working hours, 81·7 lbs.
(*e*) Average weight per cubic foot 46 lbs.

2. On the 31st October the second trial was made with Bakau, the roller taking 1,070 pieces weighing 4 480 lbs. The wood was consumed after working 57¼ hours. The result is as follows :—

(*a*) Consumption of wood per hour, in lbs. 78·25.

(*b*) Consumption of wood per hour in cubic feet 1·21.
(*c*) Average time to get 50 lbs : steam 2 hours.
(*d*) Average steam pressure during $57\frac{1}{4}$ working hours 81·6 lbs.
(*e*) Average weight per cubic foot $64\frac{1}{2}$ lbs.

3. The ordinary firewood sent in by the Forest Officer was tried on the 14th November, 604 pieces weighing 4,704 lbs. were sent out and consumed after 62 hours working.

Result :—

(*a*) Consumption of wood per hour, in lbs. 75·8.
(*b*) Consumption of wood per hour, in cubic feet 1·36
(*c*) Average time to get 50 lbs. steam 1·68 hours.
(*d*) Average steam pressure during 62 working hours 87·5 lbs.
(*e*) Average weight per cubic foot $55\frac{1}{2}$ lbs.

4. As regards residue Bakau gave the least, the ordinary firewood most.

5. It should be noted that each of the lots of firewood had been sawn and stacked in the open for much about the same length of time.

6. Attached is a separate sheet showing the above results in a tabulated form.

7. The experiments were all made with the same roller.

C. EDWIN SPOONER,
State Engineer, Selangor.

Result of experiments made with firewood, consumed on Steam Roller 3890.

Firewood.	Hours worked.	Consumption in lbs. per hour.	Consumption in cubic feet per hour.	Average time taken to get 50 lbs. steam.	Average steam pressure.	Average weight per cubic foot of firewood.
Casuarina -	105½	56·44 lbs.	1·22 c. ft.	2 hours.	81·7 lbs.	46 lbs.
Bakau -	57¼	78·25 lbs.	1·21 c. ft.	2 hours.	81·6 lbs.	64½ lbs.
Ordinary -	62	75· 8 lbs.	1·36 c. ft.	1·68 hours.	87·5 lbs.	55½ lbs.

C. EDWIN SPOONER,
State Engineer.

RAMIE, RHEA, CHINA GRASS.

The cultivation of Ramie is a subject that has from time to time for many years past been more or less before the planters of this region, and there is little doubt that if the difficulties of manipulation can be overcome there are few places in which it could be grown to greater advantage. That it can be profitably grown in any kind of soil is an error. It requires as good soil and systematic cultivation as sugar cane. There are two well defined forms generally recognized, one known as China Grass (*Boehmeria nivea*) the underside of the leaves of which are white and which has proved hardy enough to stand an English winter, and the other Ramie or Rhea (*Boehmeria tenacissima*), the leaves of which are green underneath and which requires a tropical climate. These are probably only geographical varieties of one species. In addition to these we have had in cultivation here two other well defined forms, one of them having a soft and hollow stem. No sufficiently comprehensive trial in order to determine the most profitable variety to grow in this climate has, so far as I am aware, been carried out. Judging from the size of the stems and rapidity of growth the typical Ramie (*Boehmeria tenacissima*), which is said to be a native of Malaya, though I have never come across it in a wild state, is the most promising, but whether the fibre is as good as that of China Grass (*Boehmeria nivea*) has not been definitely settled. Practically all that was known about Ramie and China Grass, both as regards planting and preparation, was summed up in the Kew Bulletin for September 1898. As regards planting an extract from Mr. FAWCETT'S report on experiments made in the West Indies states that "the best distance to plant is twelve inches apart with eighteen inches between the rows on fair land, but on strong land 18-24 inches would be quite close enough. If planted 9 inches apart they have to be hand weeded when young which is very expensive, whereas at 18 inches they can be hoed through. If the land is fairly rich and they are kept clean while they are young they will grow so thickly even at two feet that little weeding is required except perhaps after cutting." In reference to yield the following is a summary: "From a small patch of China Grass (*Boehmeria nivea*) five years old growing in the open air at Kew it has been found that 4 square yards yield 100 stems. The weight of these without leaves was 24 lbs. This gives a yield at the rate of 29,000 lbs. (say 13 tons) per acre. In Algeria, HARDY found that an acre yielded 27,000 lbs. of similar stems without leaves. DE MAS, at Padua, found that Ramie (*Boehmeria tenacissima*) yielded in the second year stems, without leaves, at the rate of 26,300 lbs. per acre; in the third year two crops yielded at the rate of 32,360 lbs. per acre. The weight of raw fibre (ribbons?) per acre obtained by DE MAS from 32,000 lbs. of green stalks without leaves 1,280 lbs. or exactly four per cent. FAVIER gives somewhat similar results. His actual yield was 1,285 lbs. per acre. In California, HILYARD gives it at 1,935 lbs. per acre. It is probable that the yield of clean ribbons per acre on a large area, with two or three cuttings, will average

about 900–1,000 lbs. per acre. Mr. CHARLES RICHARD DODGE, of the United States Department of Agriculture, is of opinion that two cuttings of second years growth when properly cultivated will produce 20 tons green stalks with their leaves. Further, as each ton of green stalks with leaves will yield 46 lbs. of clean dry ribbons or raw fibre giving 25 lbs. of degummed fibre, we have therefore a return per acre from two cuttings equal to 930 lbs. of clean ribbons and 500 lbs. of degummed fibre or filasse. No returns of the actual fibre have, however, been made continuously on a sufficiently large scale to justify absolute confidence in them." After dealing with various machines and processes of manufacture the position is summed up as follows: "We are still waiting for a Decorticator that will not merely turn out ribbons fit for further manufacturing processes, that has been accomplished, but will turn out say half a ton a day at a small cost. It is known that when ribbons can be produced sufficiently cheaply these can be degummed and turned into filasse at a small cost. The ribbons must be susceptible of being delivered at the degumming factory at a cost not exceeding £7.9 per ton. At present it cannot be done under £12.15 per ton. Then the degumming processes, of which there are many, should turn out filasse at £36–40. To put the position in other words filasse must be put on the market at about 4*d*. per pound." During the past month we have received two letters on this subject, extracts from which we give below. One of these was forwarded by Mr. ALLAN RENNEY, who has recently returned from Europe, together with samples of spun and unspun fibre, and the other from Messrs. JULES KARPLES & CO., Calcutta, who are desirous of obtaining a large supply of roots for planting.

LETTER NO. 1.

As you possibly are aware I have been connected with the flax trade for a lifetime and in consequence know the relative merits of the various economic fibres that are in use at the present time. With this knowledge in view I am of opinion that there is no fibre grown that has the possibilities of this King of all fibres. In Ireland where land and labour are comparatively dear, an acre of ground can only produce 27 stones of flax=378 lbs., worth on an average 47/ per cwt. From Ramie stems kindly sent me by Sir EDWARD LAURENCE of Liverpool, that were grown in his conservatory, I made the following simple calculations: From 10 of these I got $\frac{3}{4}$ of an ounce of fibre. If these had been grown under fair climatic conditions it is reasonable to assume that 10 stems would yield one ounce of fibre. The calculation is this, 20,000 roots plant one acre, if these produce stems each at this rate the return would be 1,250 lbs. per cutting. This yarn that I have handed you is spun from black Ramie the very worst to treat both for waste and expense. This sample is spun with the gum on the fibre which I think is the most effective way of treating Ramie for ordinary linen purposes as it can be more easily cleaned in the form of yarn than in a fibrous state. Any hardness in this yarn must be ascribed to the fact of the Ramie having been lying about 7

years before I got it to put it into its present condition.

Your friend Mr. EDWIN CUMMING, manufacturer here, will be able to assure you that he and others in his way of business would gladly welcome the introduction of this fine fibre. As to the cleaning it from gum if you can devise a simple means of decorticating the stem on the lines that I suggested I can furnish the explanations that will enable it to be cleaned out in the Straits and sent here ready to spin or bleach snow white.

NOTE.—Black Ramie appears to be the trade name for the brown ribbons simply stripped from the stem and dried.—C. C.

LETTER NO. 2.

1, POLLOCK STREET,
Calcutta, 25th February, 1902.

Dear Sir,

Under the auspices of Major PRAIN, Superintendent Royal Botanic Garden, Shibpur, I take the liberty of addressing you and shall be much obliged if you can let me know if you are able to supply me with roots of *Baehmeria nivea* (China Grass) ; as you are doubtless aware experiments have been recently made on an extensive scale in the cultivation and decortication of this plant and His Honour the Lieutenant Governor of Bengal went up to Dalsing Serai where we have a large quantity of land under Rhea cultivation, in order to witness experiments with Faure's Decorticating Machine. Both the Bengal and Imperial Governments are much interested in the extension of Rhea cultivation and it is likely that this new and important industry will soon be firmly established. The only difficulty so far is in obtaining roots. Major PRAIN has supplied all he could but there is demand for many more, and I shall be much obliged if you can help us either by supplying roots or telling me where I can most likely get them.

The Decorticator that is being u-ed in the experiment referred to in this letter is one of Faure's which has been greatly improved since it was first brought before the public. This machine weighs 11 cwt. and costs about *R.* 1,800 landed in Calcutta. It turns out pure fibre to the extent of 3 % of the weight of the stems and produces a minimum of 70 lbs. a day. Taking the value at 4 pence per lb. the value of one day's output amounts to £1.3.4. The cost of cultivation, yield per acre, most suitable varieties, and many other points, might with advantage be workd out in one of the experimental Stations of the Federated Malay States where with its abundance of cheap land and heavy rainfall it should pay if it will pay anywhere.

C. CURTIS.

FRUIT CULTIVATION.

The Cultivation of most kinds of fruits in this country is one which at present is more important as an additition to the luxury and comfort of colonial life than as a direct pecunia profirty. Excep-

tion must of course be taken to this statement as applied to pine-apples since Singapore has for a long time been famous for supplying the world with the largest quantity and the best quality of preserved pines. It is probable that later we may also preserve in quantity others of our local fruits, in the form of jams or jellies, or in other forms. On this subject I will speak later.

The number of kinds of fruit more or less good in our region whether native of the East Indies or introduced from other tropical countries is very large. Indeed almost all the really eatable fruits of the world have been at one time or another introduced into the Straits, of these many have failed to grow, some have grown well but produced no fruit, some highly spoken of by travellers in other parts of the world are found here at least to be either not worth eating or wholly uneatable. Thus the beautiful looking Coco-plum (*Chrysobalanus Icaco*) a native of Brazil, grows well and fruits abundantly, but its fruit, a pink plum with a fine bloom on it, has pithy hardly sweet and often astringent flesh, even fruit-loving animals hardly care for it, and I never found any person care to take a second bite from it.

Besides tropical fruits most of the European fruit trees have been introduced and tried on the hills and in the plains, but chiefly in the garden half way up Penang hill. There olives, apples and many other trees and shrubs of cooler climates have been tried. The olives grew well but failed to flower which might be expected as they are natives of the dryer regions of Southern Europe. Peaches, plums, cherries, and apricots have never produced fruit here. Apples fairly good and of fair size were produced in small quantities on one or two trees, but one cannot at all recommend the cultivation of these fruits, as the expense is out of all proportion to the result. The only pear tree I ever saw that fruited here was a Chinese one in Singapore which produced one of those very woody fruits such as are often sold in our markets. It was considered a great curiosity. Strawberries again have been from time to time cultivated in the Eastern tropics, and have even produced small fruits in Singapore, but they were quite flavourless. But these temperate climate fruits are not worth cultivating except as curiosities. The tropical fruits from both hemispheres are the ones to which we must devote serious attention. And first it must be noted that the colonist here as a rule has a remarkably limited acquaintance with the fruits of the country. His boy purchases for his table a few second rate bananas, inferior mangosteens, very occasionally a papaya, or rambutans when very cheap, or a field pineapple, and after a course of desserts of this kind, the colonist condemns tropical fruit as quite worthless, and pines for first class English fruit. Cooked fruit for pies or puddings is a thing unknown in very many houses. It is often asked by residents, why fruit trees are not cultivated so as to improve the flavour, and develop the fruit as has been done in Europe. To ask this question is to show the profoundest ignorance of the principles of selection by which the fruit of Europe has been developed to its present high pitch of

excellence. Look at the original stock of our best European fruits, compare the sour crabapple with the Ribston pippin, the little wild cherries and pears, with the juicy white-hearts, and large luscious pears. How have these changes been brought about? Not by planting them in gardens and manuring them, but by the competition of the consumer. For many centuries the natives of Europe have taken the trouble to get the best fruit in the market, and planted the seeds of the finest, taking a pride in having the best possible fruits on their tables, and by so doing making it worth while for the gardeners to spend much money in selecting improved varieties. But where as too often in the East the consumer thinks more of the little extra price he has to pay for good fruit, than of the importance of getting the best in the market to show on his table, it is not worth while for the fruit-grower to select his trees, as he gets just as much money for inferior fruit as for first class fruit The demand for instance for Mauritius pines as opposed to field pines by a few fruit eaters wlll not produce a large supply of these, as long as the greater part of the population demand a cheap and bad article.

To develop a fruit by selection requires a very large demand for the fruit itself, as well as a large number of purchasers who will pay more for a good article. In countries where this occurs the development of the fruit is much marked, witness the evolution of the banana from the small stony fruit of the wild plantain of our forests. The potentiality for development of our tropical fruits is limitless, the original wild fruits being far superior to anything in the temperate regions. There are numberless fruits in our forests far more worth eating than the crab-apple and the sloe, and which are hardly even eaten by the Sakais which in colder climates with fewer good fruits would have long ago been developed into good eating fruits.

There is another great difficulty in developing our fruits, which consists in the fact that they are mostly produced by large and slow growing trees. The European colonist who only lives a short time in the East, and would be the best selector of good fruit, holds the tenure of his land only for the few years he remains in the East, whereas in Europe the land would descend from generation to generation giving time for experiment and selection of the best kinds. What selection and improvement has been done in the east has been done by natives, and especially by the half castes who have resided for generations in the same spot. The Banana native of the East Indies, now cultivated all over the tropics of both hemispheres, being a quick growing plant, the fruit of which is in enormous demand has been almost entirely developed by natives, the result being the great variety of forms now known all over the world. The demand for the European and American markets is now increasing to such an extent that we may expect to see concomitantly new developments in size, and flavour, due to selection for the European's tastes. Although a great portion of the Malay Peninsula has been opened up for sometime and occupied by planters and other Europeans, all or nearly all occupying or

owning at least a garden, fruit in many parts is unaccountably rare and often unprocurable. The European in many cases considering he will only remain a short period in one place does not think it worth while to plant fruit trees of which possibly he may not see the produce. He contents himself with a few bananas, pines, and papayas. This is not the way the fruit orchards of Europe and America were formed. Many persons in cold climates plant trees which they may never live to see the fruit of, but they know well that to plant up the ground is not troublesome nor expensive and that in any case as the trees grow up they add considerably to the value of the land. It is even less expensive and onerous to plant trees here than in Europe. The trees are cheaper, labour is cheaper, and the trees require less attention than in England. Pruning, grafting, manuring would undoubtedly improve our trees in many cases, but the orchard trees are not yet at that high state of cultivation to which the European trees have attained, and much may be done with comparatively little trouble. So that there is no excuse for owners of land not planting plenty of fruit trees. As the Peninsula gradually opens up the local demand for fruit must increase and with improved methods of transport all over it can be sent to more populous parts of the country where the demand is in excess of the supply. At present however the system seems to be to wait until there is a big local demand and then to plant our slow growing trees, which will not produce fruit for a number of years afterwards. Where fruit of different kinds is abundant it is always in demand, but if there is little or none those who ought to be consumers get accustomed to do without it, or if they want fruit use American preserves. The demand for tropical as well as temperate climate fruit in the crowded countries of the North temperate region, both fresh and preserved, increases daily and though at present the Malay Peninsula is too far off many of the largest fruit markets to be able to get its fruit to the mouths of the people, it may reasonably be expected that we shall find means sooner or later to do a good export trade at least in some classes of fruits. At present we have a local demand which is increasing, not only in or around the towns and villages, but in our ports, where the passenger steamers should be able to provide themselves with a sufficient supply for voyages.

H. N. RIDLEY.

SOME NOTES ON RUBBER-GROWING.

A special article we give below is (says the *Times of Ceylon*) valuable, coming as it does from a source which combines a long experience of the rubber trade at home in its commercial aspect with the growing of the article in more than one country abroad. One of the first points dwelt upon is true promise of a large consumption. It is not necessary to dilate upon the many articles to which rubber is yearly freshly applied. Here in this small Colony

we have seen it during the past twelve months with the metal frame commencing to take the place of the older-fashioned 'rikisha wheel of wood and iron, and the introduction of rubber tyres to carriages is making slight, but perceptible, progress. But it is in London, Paris, and other capitals that the use of rubber tyres for carriages, cabs, and motors shows such continuous expansion. Taking a hansom cab as an instance, its wheels thus fitted absorb 20 lbs. of rubber, and the life of a tyre being about six months—that is the period for which the manufacturer guarantees it—we find that 40 lbs. of rubber per cab is thus used annually. It may be thought that the discarded tyre can be worked up again into yet another by the manufacturers, but this is not so. No one has yet solved the secret of devulcanization, the makers will pay only ½*d*, per lb. for such used rubber and it is then fit only to be ground up mixed with matrix rubber, and worked into soles for rubber shoes, squeegees, door mats, and other such articles requiring no special qualities. No advance is made in electricity, but rubber is required to aid it, the installation of every dynamo is dependent upon it, the cycle manufacturer's occupation would be gone if deprived of it, and its introduction in hundreds of articles of every day use is so apparent as to require no comment from us to prove how the use of rubber is advancing. The remarks made on the *Hevea brasiliensis* variety for cultivation will have the attention of our planters, and also the effort made by the writer of the article to induce every care being observed in the collection will not be lost upon them. We believe that this is the first time that reference has been made in print to the rigid specification enforced by Sir A. M. Rendle, on behalf of the British Government, which specification is likely, it is pointed out, to become in a few months the recognised standard of good rubber.

Some Valuable Points.

The following notes are written by a gentleman at present in the island (Ceylon) who from his long experience in the handling of rubber in all its forms is entitled to be considered somewhat of an authority upon the subject:—

The continued increase in the price of the raw India-rubber has naturally turned the attention of both planters and manufacturers to the extension of our existing rubber supplies. The ever-increasing demand for the manufactured article, its ever-widening field of application, the new and great demand not only for rubber tyres, but also for road vehicles, and the thousand and one applications of the manufactured material for mechanical purposes, had all so increased the demand for the raw gum, that the world's supply barely met the necessities of the demand, consequently the cost of the raw material had advanced to famine prices. Para, the standard brand, had advanced from its normal price, viz., 3*s*. per lb. to 4*s*. 6*d*., an increase that left the manufacturer poor indeed, and the producer rich beyond all telling. This increased demand not only then, but also now, promises to be permanent and to expand still more, rubber cab and cycle tyres have come to stay;

the advent of the motor car has also added to the demand. The climatic conditions of Ceylon, its temperature, its heavy rainfall, the character of its soil, all pointed to this island as being an extremely good, if not an ideal, rubber-producing country, the plantations both at Henaragoda and Edangoda, where the *Hevea braziliensis* so successfully flourishes, proved that the merely experimental stage had been safely passed; a loamy soil, with a heavy rainfall, a country not too liable to flooding, plenty of moisture in the atmosphere not too much around the roots, at any elevation up to 1,500 feet, had already proved to yield satisfactory results. Cheap and plentiful labour held out a reasonable prospect of many coolies becoming fairly intelligent in rubber collection, if properly trained. In brief, the promise of Ceylon as a rubber-producing country to the visitor versed in rubber culture was distinctly favourable; perhaps this opinion was influenced and based by the lovely climate, by the good nature of the people, and, perhaps too, by the beauty of the natural scenery.

THE FINEST RUBBER.

Far and away the finest rubber is derived from the *Hevea braziliensis*, it is hardly worth while now to experiment with any other variety, the same care and attention given to the *Hevea* will produce a far better gum, stronger in fibre and possessing a much higher breaking strain than any other, and for this reason it will command higher prices than the products of either the Syphonica or Ceara. The seeds of trees now in the island are derived from plants sent hither from Kew in 1876, and although these still produce excellent results, it is certainly worth the experiment to introduce a fresh stock direct from Manaos on the Amazon, the native home and habitat of the true *Hevea braziliensis*. Reliable agents are of opinion that the seeds can be safely sent to Ceylon if in proper and specially made germinating cases, and if this experiment proved successful Ceylon would be in possession of a new stock, the development of which it would be interesting to note, side by side, with the existing growth. The growing requires but little care. Rough weeding is quite sufficient. Upon the tapping of the trees at, say, eight to ten years old, and subsequent curing of the milk the success of the crop absolutely and solely depends, and upon this first crop also depends the reputation and future prosperity of the estate from which it is exported. A new brand placed upon the market immediately attracts the attention of the manufacturer. He is quick to secure a new rubber to discover if there be "any good thing" in it. Happy is the new rubber which has no history. It is received eagerly, put upon its trial with every wish to make the best of it. If this test is satisfactory, future success promises well; if unsatisfactory, the shadow of suspicion and the coolness of neglect will, for a time at least, hang over that estate. To secure a good result from the first collection, it would be advisable to import two or three experienced collectors from the Amazon—not a costly enterprise; and where several planters are interested and prepared to combine, the

expenses may be shared, and the more intelligent of the coolies on the interested estates duly instructed in their work. This policy was adopted by the Belgian Government on the higher reaches of the Congo, and here these Amazon experts succeeded in extracting from the African indigenous *Hevea* (sic) by careful extraction and curing, a rubber called Ruki (after an adjacent village), which is called actually better than Para itself, with a lower percentage of rubber resins, and lower percentage of foreign matter, thus offering a higher tensile strain. Naturally, this secured a better price in the European markets than Para itself, and is in great demand. This care, of course, is the ambition and goal of every grower. The same course was adopted by the Liberian Government in reference to the rubber trees near Monrovia, and at first it exported some excellent samples, truly capable of improvement; but, upon the departure of the rubber experts, the native Krew boys, either from want of care, or pure and simple laziness, abandoned due care, and consequently, Liberian rubbers are to-day more or less under a cloud in the market. The first and great care necessary, and even imperative, is absolute cleanliness in the extraction of the milk: the bark of the tree to be tapped should be carefully cleansed, the knife to be used carefully cleaned, the V shaped cuts and perpendicular central channel all should be perfectly clean before the milk is allowed to run, the collecting cups and milk can also need attention in this respect. The necessity of this seemingly excessive care is clear, in view of the fact that often-times the smallest particle of grit present may cause endless trouble to the manufacturer, depreciating or destroying the quality of his work. The manufacturer, to start with, must have his raw rubber perfectly pure. To this end the imported gum is first of all heated, then torn and rolled between friction rollers, under a stream of water to remove the foreign matter that may have been introduced through the carelessness of the collector. This constant tearing and rolling necessarily reduces the original strength of the gum. The greater the proportion of foreign matter to be removed, the greater the percentage of the loss of tenacity of the material. For instance the removal from firm Para rubber of even 5 per cent. of impurity, will oftentimes occasion the loss of 20 per cent. in strength and vitality of the resulting product. It is oftentimes the one little grain of sand which does the greatest mischief. As an illustration, may we take the case of a cycle tyre inner tube. If a little grain of sand is allowed to get into the milk in collecting, these little particles are the most difficult to remove mechanically by washing, hence the grain of sand eventually finds itself embedded in the thin skin of the cycle tube. Upon inflation the grain of sand pops out, leaving a point of least resistance, subsequent inflations tend to form a bubble, in a few days the bubble bursts; the sand has done its work, and the tube requires mending. Manufacturers know this to their cost, and are therefore willing to pay highly for a perfectly clean reliable rubber, and look with suspicion on either "gritty rubber" or "barky rubber". In the latter case the embedded fragments of bark or vegetable matter being

very difficult to remove from the gum, become charred or carbonized during the process of vulcanization at a temperature of 280° Fah., and then simply drop from the article as so much soot. These foregoing remarks refer to what one may regard as accidental impurities due to want of cleanliness or absence of sufficient care, but which, nevertheless, depreciate the value of the article from 2*d*. to 6*d*. per lb. There is, however, another form of adulteration which will in time destroy the reputation of any brand, and effectually "boycott" from the markets the estate sending it. This is the designed admixture of inferior gums, such as *Euphorbia* gum and many others of the resin class to reduce the price and illegitimately to increase the meantime profit, but to court disaster, and discredit the mark in the future. For example, some six years ago, Borneo produced a fair rubber promising with increasing care and experience better things. The producers, in their haste to be rich introduced "potatoe gum" into the milk; and down to the present time this class of rubber is hopelessly discredited and contemptuously spoken of as "dead borneo". Many other brands have met the same fate from the same cause. On the other hand, where resolute and continuous attempts have been made to improve the method of collection, such efforts have been amply rewarded. Four years ago, the poor gum of Accra, Cape Coast and Saltpond sold with difficulty at 10*d*. to 11*d*. per lb.; and now, by a process of clean collection and careful curing, the price has advanced to 2*s*. to 2*s*. 6*d*. per lb., at which it finds willing buyers. Perhaps the most striking illustration of this appreciation of quality is that shown by the Congo rubbers, the preparation of which is yearly steadily improving with a proportionate increase in price, moving from 1*s*. 3*d*. to 3*s*. 6*d*. per lb. The process of curing to produce the first grade rubbers also necessitates an experienced headman, so that the smoking or curing may be through and complete, that all the immature sap may be duly coagulated into caoutchouc. Here discrimination is necessary, secured by experience in order to smoke the milk thoroughly, yet not excessively. Great care in this process is necessitated by two considerations—in the first place, to be certain that all the sap is coagulated, failing which the immature juice will be lost in washing, causing perhaps the loss of 15 to 20 per cent. in weight, instead of 5 per cent., as in the case of a well-cured, clean rubber, and in the second place to secure its freedom from rubber resins. To the presence of these saps have been traced the cause of the rotting or hardening of vulcanized rubber. and this knowledge has led to the issue, by Sir A. M. Rendel, of a rigid specification on behalf of the Government, refusing to pass any rubber article found to contain more than 5 per cent. of rubber resins. This official specification is being rapidly adopted by the Indian Government, and by the principal engineers, and will, in a few months, become the recognized standard for a good rubber If Ceylon rubber is to command a good place in the market, it must meet this requirement; otherwise the product will be relegated to a third-class group, looked upon with suspicion and priced at "rubbish heap" rates. Recently some experiments have been

made by Professor HEINRIQUE to effect the removal of these resins by chemical treatment, with alcoholic soda.

Indian Gardening and Planting,
March 13, 1902.

GUTTA RAMBONG IN MALACCA.

In the February Bulletin No. 5, an account was given of tapping. Some $5\frac{1}{2}$ year old Rambong trees (*Ficus elastica*) the property of Mr. TAN CHAY YAN, of Bukit Lintang Estate, Malacca. Mr. TAN CHAY YAN'S method of coagulating the rubber by boiling was also explained. Specimens of the dry rubber obtained were submitted to a local expert in Singapore who reported "I estimate it com-"mercially as a good but not quite the best quality of ordinary "(Borneo rubber) clean and well prepared; value $145 to $160 per "picul."

A portion of the same sample was sent to Kew with a request that the authorities would be good enough to get it valued commercially. It was submitted to the well known experts, Messrs. HECHT LEWIS & KAHN, who reported as follows:—"It is well cured and would realize in the market from 2*s*. 10*d*. to 3*s*. per lb." It will thus be seen that Mr. PEARS writes (March 26) "I have just received a Mincing Lane valuation of TAN CHAY YAN'S rubber as follows:—2*s*. 6*d*. per lb. described as good clean fairly elastic and dry." At the time fine Java was quoted at 3*s*. 7*d*. and Borneo 1*s*. 8*d*. to 1*s*. 10*d*. It will be noticed that all the valuations are fairly approximate. The question next arises how is it that the value is so low especially when compared with the high one of 3*s* 10*d*. paid for a parcel sent home by Mr. DERRY. The cause cannot be in the curing because the reports all speak well of the condition of the sample. It is probably due to the young age of the trees, the latex being richer in Caoutchouc when the tree has attained its maximum growth. The fact should not be lost sight of that the two samples, *viz*., Mr. DERRY'S and TAN CHAY YAN'S were sent home at different dates, the first being as long ago as the end of 1899, and the other early this year, so that allowance must be made for fluctuations in price. But apart from this it would be as well for planters, speaking generally, to wait at least until the trees have attained half their maximum development before tapping. Of course in thinnings and prunings any rubber exuded may be saved, though it will probably not fetch a very high price, it will doubtless be saleable, and worth disposing of.

As pointed out, however, in an article quoted from the *Times* of Ceylon in this Bulletin, it is of the greatest importance to put good first class rubber into the market as the reputation of the product makes a great difference in the value attached to it. Hitherto "Straits rubber" has only been jungle rubber (*Willughbeia*) etc., collected carelessly by natives and naturally considered an inferior product. The reputation of the Straits rubber as first class has

yet to be made, but there is little doubt that this can and will be done.

RAMBONG IN SELANGOR.

With this number we publish an excellent photograph of a specimen of *Ficus elastica* grown on Bukit Rajah estate, in Selangor. The tree was planted in August, 1898, so that it is a little over three years old. The photograph speaks for itself and shows that this plant grows with great vigour in the Peninsula. Nothing finer could be expected from so young a tree.

B. Rajah Estate,
F. Elastica planted, August 1898.

EXPERIMENTAL PLANTATIONS.

REPORT FOR 1901.

KUALA LUMPUR, *15th February, 1902.*

SIR,—I have the honour to forward my report in connection with the Experimental Plantations for the year 1901.

2. The selection of a suitable site for the Experimental Plantations has proved to be a somewhat difficult matter, there being many questions to be taken into consideration which do not affect the average planter. Above all, it was considered essential that these plantations should be situated as centrally as possible, and the Klang district was fixed upon as being, perhaps, the chief agricultural district in the States, and easily accessible from any part of the Peninsula, being in touch with the railway and in close proximity to Port Swettenham. Unfortunately, most of the land in this district has been alienated. A block of land near the Padang Jawah station—the only available land near the railway which was likely to meet the requirements—was inspected, but after a thorough examination was deemed unsuitable. Selection of site.

3. I desire here to record my thanks to the Chairman of the United Planters' Association (E. V. Carey, Esq.), the Chairman of the Selangor Planters' Association (W. W. Bailey, Esq.), and other members of these Associations, for the kind assistance rendered in the exploration of this land. Acknowledgment of assistance afforded.

4. On behalf of the Selangor Rubber Syndicate, Mr. Bailey very kindly offered to allow Government to resume 200 acres of their estate subject to the approval of his Directors. This offer was accepted, Government agreeing to pay the sum of $500 as compensation for survey fees and other expenses incurred.

5. The site selected is part of portion G. 2,357. It is situated about midway between Kuala Lumpur and Klang, being close to the Batu Tiga station. It has a railway frontage of about three-quarters of a mile, which forms the northern boundary, the eastern and south-eastern boundaries being the Damansara river. Situation of proposed site.

6. The transfer of the land has taken a considerable time, a circumstance apparently unavoidable, but, nevertheless regrettable, as the work has been seriously handicapped in consequence. In the meantime, some nurseries have been commenced on Government land close by, where it will be possible to work up a considerable stock of plants ready for planting as soon as the proposed site becomes available. For experimental purposes, it would have been advantageous to have procured a site which comprised, to some extent, the various character of soils in use on the different estates. These, however, differ so widely that it was impossible to represent them on one small block of land. The ground on the site selected is chiefly undulating, the soil being somewhat heavy and rather deficient in organic matter. There are suitable sites for the erection Delay in transfer. Nurseries commenced. Nature of soil.

of cooly lines and also several acres of low-lying land which I intend to utilise for the growth of "padi" (rice).

Experiments in the extraction of rubber.

7. Experiments on the extraction and coagulation of the latex of *Hevea braziliensis* have been made at S'tiawan (Perak). A report of the work carried out there was furnished, a copy of which forms the subject of appendix C. The results, so far obtained, I consider entirely justify the great interest taken in this product. Although it has not been definitely decided at what age tapping operations can profitably commence, it will be seen, from the report attached, that an average yield of ¾lb. of dry commercial rubber was obtained from 6- to 7-year-old trees growing under somewhat unfavourable conditions, while 9-year-old trees gave an average of 2 lb. The largest amount obtained from one tree (9 years old) was 5 lb. 1½ oz. of dry marketable rubber.

Disparity in yield

8. One of the most notable features in connection with these experiments was that of the disparity in yield of trees of similar age and dimensions, and growing under precisely the same conditions, and apparently possessing neither specific nor varietal distinction. This fact makes it very essential that experiments—if they are to be conclusive—must be conducted on a large number of trees. It is probably accounted for by the cells, constituting the laticiferous tissue, being more intercommunicative in some trees than is the case in others. When possible, propagation should be from those trees which are known to yield freely.

Age at which tapping might commence

9. A few trees, 3½ years old, and which had a circumference of 32 inches at 3 ft. from the ground, were tapped on the Petaling Estate and an average yield of 6 oz. obtained. This is evidently too young, as the amount of rubber obtained was quite of proportion to the labour entailed. It is questionable whether trees under five years of age can be tapped profitably, but experiments in this direction are difficult owing to the scarcity of trees of the requisite age.

Other experiments

10. Other experiments are in progress and will be continued from time to time with a view to deciding any question that may arise with regard to the extraction and coagulation of latex.

The African rubber.

11. Among other new plants introduced lately from the Botanic Gardens, Gold Coast, was *Kickxia africana*, the well-known and important African rubber plant. Some seeds of this species have been distributed among the planters and some sent to the Singapore and Penang Botanic Gardens. This is the first time, I believe, that the true African rubber plant has been introduced, and, judging from the growth during the last six months, it promises to be a success.

Seeds of ornamental trees, palms, etc., were given to the Chairman of the Public Gardens Committee.

Estates visited.

12. A considerable portion of my time during the year under review has been occupied in visiting estates throughout the Native States. A thorough grasp of the state of agriculture has been gained thereby, together with the opinion of the planters on various agricultural matters.

13. A short summary of the work it is intended to carry out on the Experimental Plantations forms the subject of appendix B.

I have, etc.,

STANLEY ARDEN,

Supt., Experimental Plantations.

THE SECRETARY TO THE RESIDENT-GENERAL, F.M.S.

APPENDIX B.

13th February, 1902.

SIR,—I have the honour to enclose for your information the following short sketch of the work it is intended to carry out in connection with the Experimental Plantations.

2. The initial work must of necessity consist of working up a collection of economic plants, for experimental purposes and for distribution, if necessary; of erecting buildings—cooly lines, stores, etc.—making roads, drains, etc. Plants of economical value will be introduced from other parts of the tropics and a collection of local economic plants will also be maintained. Initial work.

3. Attention will be directed chiefly to those plants of the greatest utility, but not exclusively, as I think it would be a mistake not to avail ourselves of the opportunity of bringing together a botanical collection, as such a collection would probably contain plants destined to become economically important. A botanical collection will be maintained.

4. Experiments as to the best method of extraction and coagulation of rubber will be continued on the older trees on the different estates, and new rubber-producing plants will be introduced and their adaptability reported upon. Attention has been drawn to the disparity in yield of the "Para" rubber, and experiments with a view to accounting for this will be made.

5. A portion of the ground will be utilised for the growth of this important product. An endeavour will be made to establish species new to this country, and the hybridisation and grafting of *Coffea liberica* with other species will receive special attention. Coffee.

6. A collection of the various fibre-producing plants will be maintained, samples being sent to London for valuation, and the cost of upkeep, yield per acre, and other matters regarding the cultivation thereof will be reported on from time to time. Fibres.

7. There are several acres of land on the sites selected for the Experimental Plantations suitable for the cultivation of "padi." It is my intention to use this with a view to improving the quality and yield per acre of this product by the introduction of new seed and a process of selection. I believe that in a few years much might be accomplished in this line and possibly a hardier and more robust variety, which would withstand the varying conditions of the climate, might be established, thereby considerably reducing the risk of failure. Considering the importance of rice as a staple food, and in view of the important irrigation works being carried out by Rice.

Government to encourage the cultivation of this product, this question is, I think, worthy of special attention.

Coconuts and other plants of economical value.

8. Coconuts are particularly adapted to the conditions obtaining in the Native States. These and other oil-producing plants, medicinal plants, pepper, nutmegs, camphor, and, in short, any plant of economic value which is likely to succeed here, will form part of the collection, and when sufficient stock has been obtained will be planted out, and observations as to the best method of cultivation and probable return per acre will be made.

So far as I can judge, the work indicated above will, if properly carried out, meet to a large extent the requirements of the planters of these States.

I have, etc.,

STANLEY ARDEN,

Supt., Experimental Plantations.

The Secretary to the Resident-General, F.M.S.

Appendix C.

2nd December, 1901.

Sir,—I have the honour to inform you that I visited S'tiawan (Perak) in June last, with the object of conducting some experiments on the production and coagulation of the latex of *Hevea braziliensis*, which furnishes the "Para" rubber of commerce. These experiments being as yet incomplete, I do not intend in this report to go into details, but merely to give a summary of the work carried out there.

Conditions under which the trees were growing.

2. The trees utilised for these experiments were chiefly the property of the natives and had been much neglected. The soil, which was dry and sandy and wanting in the necessary constituents of plant life, was in places densely covered with "lalang"—*Imperata cylindrica*, a vigorous grass which chokes out nearly all other vegetation. These conditions had evidently affected the growth of the younger trees, for I have measured 3-to4-year-old trees in other parts of the Native States whose circumference was equal to that of trees growing at S'tiawan which were twice the age.

Age and dimensions

3. The trees ranged from 7 to 10 years old. The approximate height of the 7-year-old trees was 40 to 45 ft. and the average girth 2 ft. 6 in. measured at 3 ft. from the base. The height of the 10-year-old trees was 55 to 60 ft., the circumference taken at a yard from the base ranging from 3 ft. 6 in. to 5 ft., the average being about 4 ft.

Distance between the trees.

The trees had been planted irregularly, but it was noticed that some 9-year-old trees, planted 36 ft. apart, were touching each other at the tops. There is a tendency to plant trees much closer than this, and I mention this fact to show what amount of space this tree will occupy if allowed room to develope itself.

Tapping implements.

4. The incisions were made by means of a sharp pruning knife. An ordinary carpenter's chisel was also tried, but the knife found most favour with the Malays, who soon became used to the work. I prefer the knife to the chisel as with it a cleaner cut is made, thus enabling the latex to get away freely—an important point, for if impeded in its flow there is the possibility of it coagulating on the wound, thus preventing a further flow. Nor does there appear to be quite the same danger of cutting into the wood as with a chisel and mallet, and injuring the tree. I have recently had a knife made, fitted with adjustable blades, which will, I believe, when perfected, considerably reduce the cost of tapping.

Area of trunk to be tapped.

5. With a view to ascertaining what part of the trunk contains the largest amount of latex, trees were tapped at different heights, ranging from the base of the trunk to 6 ft. up. In almost every case it was found that the latex flowed most freely from the lower portion of the trunk. Ten trees were tapped on fourteen consecutive days with the following results :—

140	incisions from base to 3 ft. up gave	$395\frac{5}{8}$ oz. latex	
140	,, 3 ft. to 6 ft. up gave	$325\frac{5}{8}$,, ,,	

The greater exudation appears, however, to be chiefly confined to the first foot of the trunk, which must therefore not be neglected when tapping.

Kinds of incisions.

6. An attempt was made to determine the best kind of incision to make, and trees of the same age and dimensions were tapped with vertical, oblique, and double oblique (I \ V) incisions.

Those tapped with the V-shaped incision generally gave the best return. If these incisions are made above one another and connected by means of a small channel, forming what is sometimes known as the "herring-bone" incision, the collection of the latex is simplified, but the return was found to be less favourable than when V-shaped incisions were made about 2 ft. apart and extending over the whole area. The two lines forming the V were in each case 6 in. long.

Renewal of incisions.

7. The different kinds of incisions, which on the first occasion were made about $\frac{1}{4}$ inch wide and just deep enough to cut through the inner layer of bark, were renewed at regular intervals. It is important that full advantage be taken of what is termed the "wound-effect," and this experiment was conducted, with a view to ascertaining :

(*a*) The number of times the incision might advantageously be renewed ;

(*b*) The length of time that should elapse between each renewal.

The renewal is accomplished by taking off a very thin layer from each side of the wound, and was carried on for a full month at regular intervals, some trees being tapped every day, others every second, every fourth, and every seventh day; so that while some trees were tapped on thirty occasions others were only tapped on four. The number of occasions it is advisable to renew

the incisions was not decided, as in some cases the tree continued to exude latex even after having been tapped on thirty consecutive days. In a few cases the maximum yield was attained on the eighth day; while, in others, there was a gradual increase up till the fourteenth tapping. This difference in the behaviour of trees makes it impossible to lay down any hard and fast rule as to the number of times it is advisable to renew the incision, but in the majority of cases the maximum yield will probably be reached at the tenth or eleventh renewal.

At what interval the incisions should be renewed.

9. Nor does it appear that there is anything to be gained by allowing the trees to rest a few days before renewing the incision, for the yield of those trees on which the incisions were renewed daily was equal to, and in some cases exceeded, that of trees which were tapped at weekly intervals. The ultimate result, therefore, would seen to be dependent, to some extent, upon the number of times the incisions are renewed, and it is doubtful if a saving of labour can be effected by renewing the incisions at long intervals.

Collection of the latex.

10. Ordinary cigarette tins were used for the collection of the latex. These were attached to the tree by a small nail driven through a whole in the side of the tin, a little clay being placed between the tin and the tree to prevent any latex trickling down behind. I have had some similarly shaped tins made with a "lip" which is filed at the edges. The lip is simply pressed into the bark, no nail being required, while any escape of latex is impossible. A loose lid prevents any dirt or pieces of bark from failing into the latex. The latex exudes very slowly, and it was generally found necessary to leave the tin on the tree for about an hour after making the incision.

Coagulation.

11. Several methods of preparing commercial "india-rubber" from the latex were tried, and coagulation by the addition of mercuric chloride, sodium chloride, alum, acetic acid and other reagents was effected, but as these are still under consideration I do not intend to dwell upon them here. I am satisfied, however, that a good marketable rubber can be obtained, at a very small cost to the producer, in three or four days, if he has suitable drying accommodation at his command.

Yield.

12. The difference in yield of trees of the same age and growing under similar conditions is very remarkable, making experimental work difficult, especially when the number of trees at our command are limited. The amount of dry rubber obtained from 9-year-old trees varied from 7 to 81½ ozs. The average yield per tree was just under 2 lbs.; but, had all the trees been tapped on the most approved style and the incisions renewed an equal number of times, this amount would doubtless have been exceeded.

13. The youngest trees tapped were 6 to 7 years old, and gave an average return of 12½ ozs. of dry rubber. This was the result of fourteen days' tapping—*i. e.*, the incisions were renewed on fourteen consecutive days, so that the average yield per day was less than 1 oz. of dry rubber. As pointed out at the commencement of

this report, these trees had been much neglected, and I think it is fairly safe to prophesy a return equal to this from European estates, where the trees receive every attention in from five to six years from the time of planting.

14. The experiments instituted at S'tiawan will be carried on from time to time, and samples of rubber prepared by various methods will be sent to England for valuation and the results reported to you in full. In the meantime, too much stress should not be laid on these, the results of a single experiment. **Experiments to be continued.**

I have, etc.,

STANLEY ARDEN,

Supt., Experimental Plantations.

THE SECRETARY TO THE
RESIDENT-GENERAL, F. M. S.

NOTES.

SEEDS OF CASTILLOA.

To the Editor,

Agricultural Bulletin of the Straits and F. M. S.

Dear Sir,

As great interest has been taken in the cultivation of the differr ent varieties of rubber producing trees. It may interest youreaders to know that the vitality of the seeds of "Castilloa Elastica" is not so fugitive, as they may have been led to believe by various reports. Last year I imported a few thousand of these seeds from Mexico, 260 of which I forwarded to Samoa, and I have received a letter to say that 197 have developed into healthy seedlings. The total number of days that these seeds were *en route* was as follows:—

Mexico to Burma	...	99 days.
Burma to Samoa	...	77 ,,
Total	...	176 ,,

So if due care is taken with the packing of these seeds, they carry well.

Yours faithfully,

W. S. TODD,
Amherst,
LOWER BURMA.

A SUBSTITUTE FOR CORK.

For some time it has been realized that the supply of Cork, the bark of the Cork-oak (*Quercus ilex*) is not at all equal to the demand, and a good substitute is badly required. It is I fear hardly

likely that we shall find any tree in our forests which will supply an article as suitable for the various purposes for which the bark of the Cork-oak is used. It is worth recording, however, I think, that for bottle corks in Singapore, the Chinese are using in considerable quantity the pithy midrib of the leaf of the sago palm. The dead leaves are taken and stript of the leaflets, the rachis on which the leaflets are set is cut up for corks. They are used for milk-bottles chiefly where the cork once drawn is not required again. It may be doubted whether the texture is sufficiently close to be used for wine or any volatile liquid, but for many purposes the pith would do as well and would be certainly cheaper. Many years ago it was used at our local Museum in the place of Cork for insect boxes, and we may yet find other uses for this waste product.

H. N. R.

Rubber plants for Sale.

The Resident Councillor of Malacca writes that he has of over-stock eight thousand seedlings of Para rubber, and six hundred plants of Rambong (*Ficus elastica*) to dispose of. Para rubber plants for 3 cents apiece, or if over three thousand are taken 2½ cents; Rambong plants at 25 cents each.

A Gambier Disease.

Specimens of diseased Gambier shoots were lately sent to the Botanic Gardens from Indragiri. The disease does not appear to have done very much harm at present but the facts are worth noting. The terminal shoots wither turn black and die. Examination shewed no trace of any fungus but the stems were swollen and split in parts. The shoots were much infested with coccus, and with the specimens were sent some examples of a bug which is not rarely to be seen on herbage. A species of *Centrotus,* a small boat-shaped brown bug armed with sharp recurved horns over its back. I have no notes as to the life history of this animal, nor can I find that anything has been recorded as to its habits, but it belongs to a destructive group of insects and may be responsible for the damage.

Singapore Flower Show.

It is proposed to hold a Flower Show in Singapore in the end of July. The exhibition includes Ferns, Selaginellas, and flowering plants of all kinds, and is open to the Colony and Federated Malay States. The exact date will be fixed later, and schedules of the prizes will be sent out in about a month or earlier to any applicant.

NOTICE.

(1)

The Para rubber trees in the Botanic Gardens, Singapore, are now commencing to produce the seed crop. Planters who have put their names down in previous years for seed, and no longer want any are requested to write to the Director to inform him.

(2)

Correspondents acknowledging the receipt of Bulletins, *are requested to stamp their letters fully*, as a large number of letters have been received from various parts of the world either not stamped at all, or insufficiently stamped.

(3)

All applications for Bulletins in future should be made to the Editor.

SINGAPORE MARKET REPORT.

March, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	32.00	32.00
Bali	110	24.50	24.00
Liberian	539	18.50	18.00
Copra	3,336	8.50	10.50
Gambier	2,625	12.25	11.15
Cube Gambier, Nos. 1 & 2	105	18.50	15.00
Gutta Percha, 1st quality	...	500.00	350.00
Medium	...	350.00	200.00
Lower	...	200.00	50.00
Borneo Rubber	...	134.00	72.00
Gutta Jelutong	...	6.25	5.30
Nutmegs, No. 110's	...	52.00	49.00
No. 80's	...	73.00	70.00
Mace, Banda	...	105.00	95.00
Amboyna	...	78.00	70.00
Pepper, Black	757	31.25	29.75
White	225	52.50	51.50
Pearl Sago, Small	25	4.90	4.45
Medium	...	5.00	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	3,520	3.75	3.35
No. 2	395	3.40	1.80
Flake Tapioca, Small	386	8.30	5.15
Medium	10	6.00	5.25
Pearl Tapioca, Small	283	6.87½	5.00
Medium	948	7.75	4.90
Bullet	...	6.50	6.00
Tin	2,305	76.00	70.37½

London Market.

Benzoin.—The arrivals this week include 66 cases and 80 cases from Singapore per S. S. *Stentor* and *Shanghai* respectively, and 36 cases from Penang.

Cocaine.—Is very firm but unchanged at maker's quotation of 17*s.* 9*d.* per oz. The stocks of crude at Hamburg and the factories continue to be well held, and makers have paid full to dearer prices.

Dragon's Blood.—The S. S *Stentor* and *Shanghai* have brought 9 and 5 cases respectively from Singapore.

Oil, Castor.—Small sales of Calcutta seconds have been made at 3*d.* per lb. Medicinal French is easier, being quoted 31*s.* 10*d.*

per ton, and first pressings £29 in barrels, *ex* wharf. Belgian is also easier at £26 for first pressings, *ex* wharf.

Oil, Lemongrass.—Business has been done privately at 6*d*. per oz. spot.

Spices.—Pepper is dearer for Singapore black, owing to firmer advices from abroad. The spot quotation has been raised to $5\frac{13}{16}d$. per lb. and the same price is asked for March-May shipment. On the other hand, white is rather lower, business has been done at $9\frac{5}{16}d$. per lb. for Penang to arrive. The quotations on the spot are $9\frac{1}{2}d$. for Penang and $9\frac{3}{4}$. for Singapore. Zanzibar Cloves are firmer at $3\frac{1}{16}d$. per lb. for March-May delivery, and $3\frac{1}{16}d$. for June-August.

The Chemist and Druggist. March 29, 1902.
(Per Mail advices of March 14, 1902.)

Coffee.

The London Commercial Record says :—Supplies of East India at auction have been on a larger scale, and for the most part firm to rather higher prices were paid, especially for fine home trade qualities, which have been in strong demand; dull and inferior had generally to be withdrawn and they are in very poor request. Catalogues to-day presented for public competition.—585 barrels, 409 bags Jamaica, 984 bags Guatemala; 999 bags Salvador, 1,113 bags, Costa Rica, 168 bags New Granada, 535 bags Colombian, and 77 bags Guayaquil. The sales went off at full prices for good qualities, but common grades were in buyers' favour. Yesterday the sales went off very irregularly, the higher grades alone maintaining values. Costa Rica and Central American descriptions have been in fair request at previous rates to an occasional decline. Little enquiry for Santos was experienced.

The market for "futures" has been easier, but closes at a slight improvement. May delivery sold yesterday at 30*s*. 3*d*. to 30*s*. 6*d*. July at 31*s*. September at 31*s*. 3*d*. to 31*s*. 6*d*. and December at 32*s*. to 32*s*. $4\frac{1}{2}d$. We quote:—

London	Santos	May delivery	30*s*. 9*d*.
New York	No. 7 Rio	„	5.30 cents.
Hamburg	Santos	„	$30\frac{1}{2}$ pf.
Havre	Santos	„	$36\frac{3}{4}$ francs.

At the Dutch Trading Co.'s public sale at Amsterdam on Tuesday next 16,280 bags 25 cases will be offered. Good ordinary Java is valued at $34\frac{1}{2}$ cents.

Imports, Deliveries and Stock of Coffee in London are as follows :—

	Stock.		Imports.	
	1902.	1901.	1902.	1901.
Tons ...	15,668	14,812	8,424	8,008

	Home Consumption		Export.	
	1902.	1901	1902.	1901.
Tons	3,633	4,654	1,463	3,518

The preceding figures exhibit ...	Tons.
In the Imports an increase this year of	416
Home Consumption a decrease of ...	1,021
Export a decrease of	2,055
Stock an increase of	856

Auctions this week have passed off as under:—

East India, 4,985 bags half sold as follows:—Mysore, smalls 44*s.* to 60*s.*, low middling to middling 52*s.* to 64*s.* 6*d.*, good middling 70*s.* 6*d.* to 75*s.*, good to fine bold 81*s.* to 95*s.*, very fine 104*s.* 6*d.*, peaberry 62*s.* 6*d.* to 95*s.* Coorg, smalls 44*s.* 6*d.* to 56*s.*, fine ditto 64*s.*, low middling to middling 56*s.* 6*d.* to 64*s.*, good middling 67*s.* 6*d.* fine middling 94*s.* fair to good bold 75*s.* to 90*s.* very fine blue bold 109*s.*, peaberry 60*s.* to 110*s.*. Wynaad, smalls 47*s.*, peaberry 64*s.*, Mocha 110 half-frazils withdrawn.

Jamaica.—Forty-four barrels, 21 bags mostly sold, low middling greenish and brownish 52*s.* to 54*s.*, bold dull colory 68*s.* 6*d.*, peaberry 55*s.* 6*d.* to 56*s.*

Costa Rica.—One thousand six hundred and six bags sold, smalls 46*s.* 6*d.* to 63*s.* 6*d.*, good ordinary greenish 45*s.* 6*d.* low middling 57*s.* 6*d.* middling to good middling blue 65*s.* 6*d.* to 77s., bold 73*s.* 6*d.* to 91*s.*, fine bold 93*s.* 6*d.* to 100*s.*, peaberry 65*s.* to 100*s.*

Guatemala.—972 bags half sold, smalls 45*s.* 6*d.* to 52*s.* 6*d.*, middling to good middling 54*s.* to 65*s.* 6*d.*, bold 75*s.* to 82*s.*, peaberry 65*s.* 6*d.* to 75*s.*

Salvador.—248 bags sold, smalls 45*s.* 6*d.* to 56*s.* 6*d.*, low middling greenish 50*s.*, good middling blue 65*s.* 6*d.* to 66*s.* 6*d.*, bold 76*s.*, peaberry 56*s.* 6*d.* to 78*s.* 6*d.*

Colombian.—Of 376 bags offered 110 bags sold, good ordinary brownish 36*s.*, middling greenish 50*s.*, common bold 53*s.* 6*d.*, peaberry 49*s.* to 53*s.* 6*d.*

Nicaragua.—50 bags sold, good ordinary greenish 44*s.* to 46*s.*, low middling 50*s.*, peaberry 50s.

Venezuelan.—42 bags half sold, bold dark greenish 57*s.* 6*d.*

Brazil.—Of 962 bags unwashed Dumont Santos, quay terms, 170 bags sold, small 28*s.* 6*d.*, bold ditto 33*s.* to 34*s.*, 274 bags washed Dumont Santos were bought in.

Receipts in Rio and Santos.

	1901-2.	1900-1.	1899-00.	1898-99.
Since July 1.—	Bags.	Bags.	Bags.	Bags.
Rio -	4,285,000	2,177,000	2,803,000	2,508,000
Santos -	8,455,000	6,693,000	5,221,000	4,719,000
Total...	12,740.000	8,870,000	8,024,000	7,227,000
Crop... ...	10,900.000		8,971,000	8,772,000

Rio Exchange $11\frac{27}{32}$*d.* previous day 12*d.*

Havre, March 13.—Good average Santos March opened quiet at 36¼ f. and closed steady at 36¼ f., May opened at 36¾ f. and closed 36¾ f., July opened at 37¼ f. and closed at 37¼ f., September opened at 38 f. and closed at 38 f., December opened at 38¾ f. and closed at 38¾ f.

Hamburg, March 13.—Good average Santos March opened quiet at 30¼ pf. and closed quiet at 30¼ pf., May opened at 30¼ pf. and closed at 30½ pf., July opened at 30¾ pf. and closed at 31 pf., September opened at 31½ pf. and closed at 31½ pf., December opened at 32¼ pf. and closed at 32¼ pf.

New York, March 13.—Closing prices of No. 7 Rio were as follow :—

	March.	April.	May.	June.	July.
March 13,	5.10	5.20	5.30	5.35	5.45
March 12.	5.10	5.20	5.30	5.35	5.45

India-Rubber.

The market has fluctuated, and after a firm market and higher prices at the beginning of the week we close quieter, with sellers of hard fine forward at 3*s.* 2½*d.* and spot at 3*s.* 2*d*; soft cure, fine. the same though very little offering; hard cure, entrefine, has been sold at 3*s.* 0½*d.* to 3*s.* negroheads, sales of scrappy at 2*s.* 7½*d.* per lb. Cametas at 2*s.* 2*d.* to 2*s.* 2½*d* being very scarce, as also are Island negroheads, nominal quotation 2*s.* Peruvian.—Sales of fair ball at 2*s.* 5*d.*; and small lots of slab spot up to 2*s.* 1½*d.* per lb. There has been a large business in medium kinds here and in Liverpool at rather better prices.

Singapore.

Abstract of Meteorological Readings for March, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·882	142·5	78·9	87·1	71·8	15·3	76·0	·828	74·0	77	N. E.	3·38	1·13

K. K. Hospital Observatory,
Singapore, 10th April, 1902

A. B. LEICESTER,

Assistant Surgeon and Meteorological Observer.

Penang.

Abstract of Meteorological Readings for March, 1902.

District.	Mean Barometerical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%	miles.	ins.	ins.
Criminal Prison Observatory	29·901	146·9	81·4	91·7	73·6	18·11	76·2	·802	71·1	69	91·67	5·94	1·52

G. D. FREER,

Acting Colonial Surgeon, Penang.

Penang, 7th April, 1902.

Malacca.

Abstract of Meteorological Readings for March, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		ins.	ins.
General Hospital.	29·834	151·6	82·8	90·3	70·1	20·2	81·2	1·039	55·3	92	N.	3·79	1·10

Malacca, 12th April, 1902.

F. B. CROUCHER,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet.	Vapour Tension.	Humidity.		
Taiping ...	158	82·75	96	71	25	77·81	·886	79	14·98	3·42
Kuala Kangsar ...	...	82·75	96	69	27	76·48	·829	74	7·39	2·18
Batu Gajah ...	162	82·23	95	71	24	77·05	·860	78	4·28	·85
Gopeng ...	...	82·66	95	66	29	77·04	·853	77	6·39	1·35
Ipoh ...	...	83·08	95	70	25	77·23	·856	76	5·09	1·82
Kampar ...	...	...	92	70	22	...	...	...	14·14	3·00
Teluk Anson ...	...	82·48	92	71	21	77·53	·877	79	11·61	3·15
Tapah ...	..	81·85	94	67	27	76·95	·863	79	7·50	1·54
Parit Buntar ...	...	82·69	93	71	22	77·70	·883	79	8·65	2·90
Bagan Serai ...	...	82·47	91	69	22	77·68	·883	80	9·99	2·63
Selama ...	...	82·97	93	71	22	77·58	·874	78	11·64	4·10

STATE SURGEON'S OFFICE,
Taiping, 14th April, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·807	151·8	81·7	90·2	71·6	18·6	75·5	0·771	71·4	73	Calm	9·65	2·12
Pudoh Gaol Hospital „	...	...	...	...	...	..	...	...	...	...	...	9·60	2·53
District Hospital „	...	...	...	...	...	...	...	...	...	...	...	6·91	1·30
„ Klang	...	...	...	87·0	74·8	12·2	...	...	...	...	...	5·33	1·25
„ Kuala Langat	...	...	...	86·8	74·5	12·3	...	...	...	...	...	1·19	0·54
„ Kajang	...	...	...	86·9	75·8	11.1	...	...	...	...	...	6·36	1·23
„ Kuala Selangor	...	...	...	86·9	76·4	10·5	...	...	...	...	...	5·40	1·52
„ Kuala Kubu	...	...	...	93·0	71·7	21·3	...	...	...	...	...	7·34	1,78
„ Serendah	...	...	...	90·0	77·2	12·8	...	...	...	...	...	9·52	1·64
„ Rawang	...	...	...	86·6	74·3	12·3	...	...	...	...	...	8·52	1·64
„ Jeram	...	...	...	...	...	...	...	...	...	...	...	4·05	1.40

State Surgeon's Office,
Kuala Lumpur, 10th April, 1902.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for March, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfa'l.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, Genrl. Hospital	...	...	...	90·	70·	10·1	...	...	...	...	...	3·43	1.47
Kuala Lipis - -	...	...	...	96·5	68·0	28·5	...	...	...	...	...	2·38	·80
Raub - - -	...	...	...	91·0	69·0	22·0	...	...	...	...	...	4·00	1·18
Bentong - - -	...	...	...	90.5	64·5	26:0	...	...	...	...	...	6·21	1·97
Kuantan - - -	...	...	...	84·	70·	14·	...	...	...	...	...	4.25	1·47
Temerloh - - -	...	...	..	92·	71·	21·	...	...	...	...	...	2·02	·42

Residency Surgeon's Office,
Kuala Lipis, 10th April, 1902.

P. N. GERRARD, M. D.,
Acting Residency Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for March, 1902.

District.	Mean Barometical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.			82	91	70.5	20.5	74				N. E.	3.34	0.84

Muar, 4th April, 1902.

FRANCIS PEARS.

No. 9.] JUNE, 1902. [Vol. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M.A., F.L.S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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SINGAPORE:

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at the Government Printing Office.

NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 9.] JUNE, 1902. [Vol. 1.

RUBBER NOTES.

Extract from Annual Report of R. Derry.

Para Rubber Tapping.

Thirty-two trees about 12 years old were tapped and 125 lbs. of dry rubber obtained, or nearly an average of 4 lbs. each tree. This tapping was carried on more to shew the method adopted than experiment, and was inspected by some planters in Perak, and from Selangor. The best flow of latex commenced in August, although some trees had been tried earlier. The season, however, with many varieties of trees shewed much variation, for instance, coco-nuts were flowering in September which is two, or more, months earlier than is usual at Kuala Kangsar. A deciduous Ficus which has shed its leaves in February for four consecutive years did so last year in December. This variation was most probably influenced by the dry months in the first half of the year, and the latex of Para Rubber undoubtedly exudes best on wet days. I should think the best season for tapping would be from June to November.

Experimental Tapping.

Two Para Rubber trees in Taiping garden about 10 years old and with girths of 4′ 2″ and 4′ 7″ at 3 feet from the ground were tapped as follows:—three sets of incisions were opened on each tree, and each set consisted of a centre channel about four feet high (from the ground) and 5 oblique cuts on each side, or 30 oblique cuts on each tree—equal to three annual tappings in respect of area of trunk operated on, the three sets being placed round the trunk of the tree so that each set took up rather less than a third of the area of the trunk from the base to the height mentioned, *viz.*, 4 feet. Each set of incisions was numbered and the result recorded, both trees being tapped alike and in the following manner:—

	Tree I. Girth 4′ 2″.	Tree II. Girth 4′ 7″.
	Yield.	Yield.
1st set wounded or tapped lower side of all oblique cuts - - - -	$8\frac{3}{4}$ ozs.	$9\frac{3}{4}$ ozs.
2nd set wounded or tapped upper side of all oblique cuts - - - -	$8\frac{3}{4}$ ozs.	$8\frac{1}{4}$ ozs.
3rd set wounded or tapped both sides of all oblique cuts (*i. e.* upper and lower sides) - - - - - -	$10\frac{3}{4}$ ozs.	$8\frac{1}{2}$ ozs.
Total dry rubber -	$28\frac{1}{4}$ ozs.	$26\frac{1}{2}$ ozs.

The result of both trees is therefore :—

Tapping upper side of cuts	-	- 17 ozs.
,, lower side of cuts	-	- $18\frac{1}{2}$,,
,, both sides of cuts	-	- $19\frac{1}{4}$,,

This tapping commenced on September 16th and was carried on until September 29th, each tree having been tapped eleven times, and I would observe that 7 or 8 more tappings might have been made without removing an extravagant amount of bark. I conclude from the result obtained that, only one side of each incision need be tapped, and that the lower side is preferable. As will be seen, the result of tapping the lower cuts is better than the upper ones, and nearly as good as tapping both, while the additional work is equal to tapping another tree, as much more careful work is necessary with the upper cuts to prevent the latex from overflowing and splashing outside the channel.

From these trees I do not suppose that any more, or very little, rubber was obtained by three sets of tappings than would have been obtained from one set, as will be seen from the following result obtained from another tree which is 14 years old and has a girth of 5′ $0\frac{1}{2}$″ at 3 feet from the ground. This was tapped in the usual way—a centre channel 4′ 6″ high and 5 oblique cuts on each side of the channel :—

September 21st -	- $2\frac{1}{2}$ ozs.		
,, 22nd -	- $1\frac{3}{4}$	,,	
,, 23rd & 24th	$7\frac{1}{4}$	,,	evening 23rd, morning 24th.
,, 25th -	- 4	,,	
,, 26th -	- $4\frac{1}{4}$	,,	
,, 27th -	- $5\frac{3}{4}$	,,	
,, 28th -	- $7\frac{1}{4}$	,,	
Dry Rubber	$32\frac{3}{4}$	,,	

About 2 lbs. of dry rubber in 8 tappings and the latex running freely and increasing daily when the tappings had to be abandoned as more time could not be spared. It will be noted, and I am of opinion that, the latex exudes better when the trees are tapped daily than at intervals, but a few days should elapse after first opening an incision before daily tappings commence.

Cost of Tapping.

I consider that a man capable of using a knife and chisel smartly, after sufficient practice, could tap 4 trees in an hour, and supposing the hours best suited for tapping be limited to 5 hours per diem, say 6-9 a. m. and by 4-6 p. m., an average of 15 to 20 trees could be tapped in a day. This would leave 3 hours for collecting and other details. At an estimate of 2 ozs. of dry rubber per tapping, and price and exchange at 2/-, the cost of tapping and collecting would be about 16 cents per lb. at a rate of pay from 30 to 40 cents per diem.

Ficus Elastica (Rambong).

Two trees of this rubber were tapped in the manner described in last year's report and 20 lbs. of dry rubber obtained. These trees are about 12 years old, but one is growing on hard laterite soil and is not a robust tree. There are only 4 large trees of this rubber in the garden and these have now yielded 70 lbs. of rubber between December, 1900 and January, 1901.

A few hundreds of seedlings have been raised but so far I have not received an application for any. It would be an easy matter to produce thousands if required. There has been some enquiry for seeds

R. DERRY.

19 April, 1902.

PRODUCTION AND CONSUMPTION OF COFFEE.

The French Consul in Brazil, in a report on the state of trade in that country, states that there is an over-production of coffee throughout the world, and that in Brazil there is a tendency to restrict the area of cultivation. He says that in the year from July 1, 1900, to June 30, 1901, the total production of coffee throughout the world was 15,460,000 bags of 132 lbs. each, and that of this quantity 11,500,000 bags were grown in Brazil, 1,150,000 in Guatemala, Costa Rica, Mexico, and Nicaragua, 1,050,000 in Venezuela, Colombia, Ecuador, and Peru, 480,000 in the Dutch Indies, 450,000 in Hayti, 315,000 in British India and Ceylon, 200,000 in Puertorico and Jamaica, and 90,000 in Padang. He estimates the consumption at 14,117,620 bags, leaving an excess of production at 1,342,380 bags.

Ex. Weekly Edition, "Times".

April 11, 1902.

SOME REMARKS ON RUBBER PLANTATIONS.

We are inclined to look upon the rapidly increasing interest which is being taken in the rational exploitation of rubber districts, and in the starting of rubber plantations as a sign of hopeful augury

for the future. There can be no doubt that were it not for the faraway climate required for the growth of rubber trees, the interest displayed by manufactures in the cultivation and exploitation of rubber trees would long ago have assumed a practical shape of the same kind as is shown by the manufactures of beet root sugar on the Continent, and which is responsible for much of the enormous development and success of that industry.

Much has also been achieved in regard to the question as to which of the numerous rubber trees offer the best prospects for the purpose of methodical cultivation in different parts of the world, although it cannot be said that this important question has finally been settled in favour of one species or the other.

But great uncertainty and much diversity of opinion still exists regarding the most satisfactory method of tapping the trees, collecting the latex, and, chief of all, concerning the most rational process of converting the latex into the most perfect form of commercial rubber. Indeed, we consider the most important preliminaries in the exploitation of a rubber district to consist (1) in the careful physiological examination of the tree, and (2) in the exhaustive investigation of the chemical and physical problems arising in the coagulation of any given latex. Upon the first of these two points depends the life of the trees under exploitation, upon the second the quality and market value of the rubber produced.

Now while the first of these two points has in the past received a good deal of attention, the second is generally studiously neglected, or more or less perfunctorily enquired into. In saying this we are by no means unmindful of the valuable suggestions due to Biffen, and of the interesting results obtained by M. HARNET in the Soudan, but we are not aware that at present rubber exploitation companies have realised the necessity of investigating in a systematic manner and by the methods of modern chemical research the best conditions for the coagulation of the latex.

Coagulation of Latex.

We have often felt that there seems to be some sort of unexpressed, but generally accepted notion that the mode of coagulation may affect the general purity of the rubber produced, its colour, percentage of occluded water, and general suitability, but that it has no influence upon the intrinsic quality of the india-rubber itself. In other words, it appears to be taken for granted that the india-rubber exists in the latex of the tree as a substance identical with that of its commercial forms, as is, for instance, certainly true of the oils. We venture, therefore, to submit to the consideration of those interested in this subject the following points which we believe to have an important bearing upon the quality of the rubber produced from a latex :—

1. It is extremely doubtful, if not altogether improbable, that rubber as such does not pre-exist in the latex, but merely a substance capable of agglomeration by polymerisation (coagulation).

2. This being conceded, and the results of a careful chemical and microscopical study of the latex leave very little room for doubt

on this point, it is at once obvious to all those familiar with the peculiar physico-chemical phenomenon known as polymerisation, that the properties of the product of the coagulation of the latex, the quality of the india-rubber produced, is not onesidedly determined by the species of the tree furnishing the latex, but is capable of variation between very wide limits.

3. The nature of this variation must therefore be determined by the physical, but even much more by the chemical conditions observed in the carrying out of the coagulation process.

4. So far the truth of this has been recognised only in regard to the physical conditions observed, the variation of the quality of the rubber produced due to specific and definite chemical conditions has hardly been recognised yet otherwise than in the crudest fashion, and it certainly has not been made to our knowledge the object of systematic investigation.

5. These will probably have to be made on the spot so as to render it possible to examine the latex in its virgin condition, as it is highly probable that the preserving agents which have to be added to the latex, in order to render it sufficiently permanent for shipping it to Europe, almost certainly result in differentiating it more or less from the original product.

C. O. WEBER,

Extracted from the India-Rubber and Gutta-Percha Trades' Journal. February, 17th, 1902.

A RUBBER PLANTATION IN GUATEMALA.

This account of a large plantation of Castilloa is taken from an article in the Journal d'Agriculture Tropicale (No. 9 March, 1902) by M. RENÉ GUERIN, and will interest many planters. The plantation belongs to M. JOAQUIM ASTURIAS, and is known as the Finca (hacienda, plantation) El Baul. A large sample of the rubber was exhibited at the Paris exhibition and received a gold medal.

The plantation includes about 50,000 trees of which 30,000, from 10 to 15 years old are producing rubber. The soil very copiously watered consists of zones of sand and of black soil. There seems no difference in the appearance and production of the trees on either zone. The trees shed their leaves in March and April, the dry season, when the seeds are ripe.

All the trees in the plain country furnish regularly a latex of the same quality, but those on the mountain-slopes, which have to stand a drought, give a greater amount of latex in the wet season than in the dry one, but as the latex is less rich in rubber the return is the same.

Castilloas grown in the plain begin to give seed in the third year. Those grown in the forests, under shade grow more slowly and are at that age scarcely 9 feet tall, but as soon as they get

through the mass of trees above them and get into full sun, they develop very rapidly, attain a large size and an exceptional strength.

The seeds lose their germinating power in about a month. It is recommended here not to wash them and especially not to expose them to the sun. They are preserved in lime or in charcoal dust.

The trees are tapped with an-instrument like a parang of which the end which is square is rolled on itself so as to make a tube large enough to admit the finger and sharpened, *Fig. A.* Another shorter form with a smaller incurved point is an improved form manufactured in the United States. *Fig B.* The incurved edges are the cutting part of the instruments.

The cuts are made horizontally, half or three quarters of the circumference of the tree, on the stem and larger branches about 16 inches apart, of course they must not completely surround the tree or they may kill it. The latex exudes in very watery drops at first, this is allowed to drop on the ground and not preserved. After a minute or two this watery latex ceases and a thicker latex exudes which sticks in the incisions. At the end of 48 hours it is taken out in the form of ribbons which are washed and dried in the shade. Exposure to the sun makes it sticky. Each tree is tapped 4 times a year, on different sides, each tapping gives $\frac{1}{4}$ kilogramme (half a pound) of rubber, one kilogramme per year.

These figures however are only reached when the bigger branches are tapped. When only the trunk is tapped, only half this amount is produced. The tapping of the branches is very troublesome and though they produce as good a latex, as a rule, the trunk only is tapped.

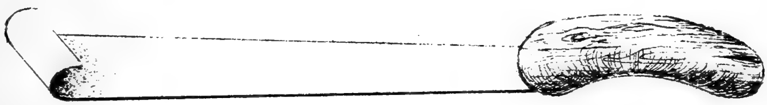
The incisions made by the above-mentioned tool heal up completely in 3 or 4 months whereas those made in the ordinary native way with the machete (parang) take four times as long to heal.

The objections to the El Baul tool are that the work is very fatiguing, the cutting edge very difficult to sharpen on account of its semicircular curve, and if it is not very sharp it rubs off bits of the bark and so dirties the rubber.

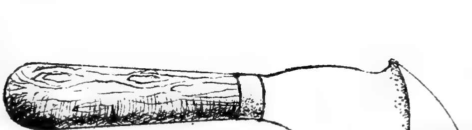
There seem to be two Castilloas in cultivation in Tropical Central America, apparently exactly similar in appearance, but one produces a very fluid latex, while in the other it is too thick to flow. The trees we have here in Singapore as far as I have been able to examine them have a very thin latex which flows very readily.

GROWTH OF PARA RUBBER TREES.

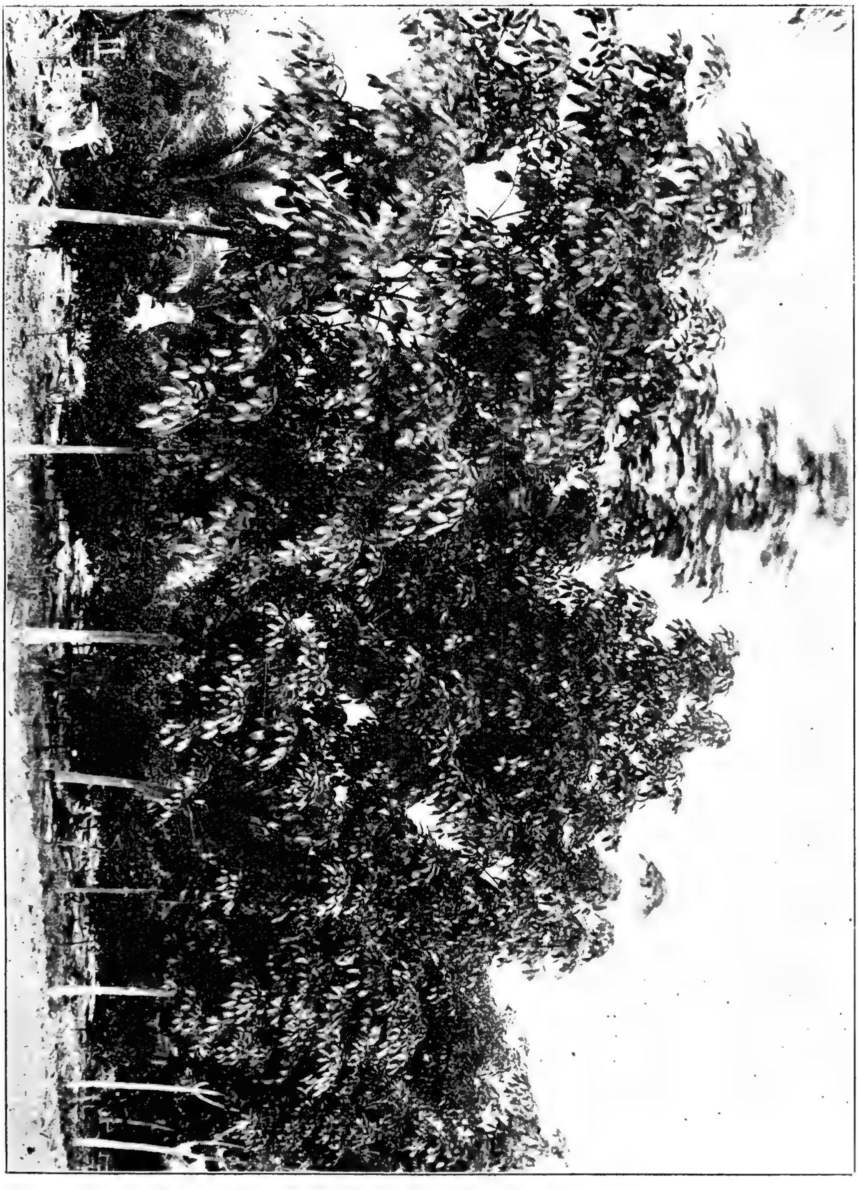
We give this month an interesting photograph of a row of Para rubber trees planted in Bukit Rajah estate, Selangor, to show the rapidity of growth of the plant under good treatment. Taking the trees in order and commencing at the left hand of the plate, the following are the dimensions and age of the tree, the girth being taken at a height of four feet and a-half from the ground, by Mr. F. A. Calloway :—



A



B



No.	When planted.	Girth.	Height.
1	April to May, 1898.	19½ inches.	31 feet 8 inches.
2	End of 1898.	12 ,,	36 feet.
3	April to May, 1898.	23 ,,	33 ,,
4	do.	19¼ ,,	36 ,,
5	End of 1899.	9 ,,	27 ,,
6	April to May, 1898.	19 ,,	31 feet 6 inches.
7	do.	14½ ,,	35 feet 8 inches.
8	do.	18¼ ,,	36 feet 6 inches.

FUNGUS ON RUBBER.

In the annual report of the Government Mycologist in Ceylon (Mr. J. B. Carruthers) is the mention of a fungus which grows on samples of Para rubber. It grows more abundantly on samples treated with acetic acid. It is a species of *Syncephalis* and causes red markings in the sample though not destroying its translucency. Further investigations are being made.

RUBBER VINES IN FRENCH INDO-CHINA.

In the Revue des Cultures Coloniales No. 98, (April, 1902) M. Gustave Quintaret gives accounts of two unidentified rubber vines found in Annam and Laos respectively and a more extensive account of these with the addition of seven more is published in the Bulletin Economique of the Government of Indo-China, Series 2, No. 2, by M. Achard. Of these only three have been identified as the botanical specimens of most were inadequate, not possessing flowers. One called Mak Khao Ngua, is identified as *Ecdysanthera micrantha,* Dec. an apocynáceous plant occurring in Laos and Annam and also a native of the Himalayas as far south as Ava. It does not occur as far as is known in the Malay Peninsula.

M. Quintaret has extracted a latex which appears very rich in Caoutchouc and is readily coagulated by citric acid. The rubber is of a blackish brown colour inclining to red and of excellent quality and is already being exported. The fruits according to M. Achard are eaten by the Laotians on account of their acid flavour. The vines are tapped when they are 3-4 centimetres through (1 inch. to 1½ inch.) There seems to have been no previous record of *Ecdysanthera,* producing rubber.

A second species Khua Mak Khao Nghe has been identified as *Parameria barbata,* of Pierre. It gives a black rubber.

The Paramerias all give a more or less valuable jungle rubber, but hardly of first quality.

Khua Katang Katiou is a species of *Micrechites,* and the name *Micrechites napeensis,* is proposed for it. The liane is slender, attaining in some specimens a diameter of .08 metre (3 inches) and a plant cut down by M. Achard measured along its principal stem 72 metres (222 feet). A M. Foret stated that he had seen stems two years old as much as 20 metres in length. The rubber is black.

Of the unidentified species two give respectively a red and white rubber apparently valuable, the remainder an inferior or practically valueless sticky rubber. These jungle rubbers are it seems very abundant in many parts of the region and the rubber is collected by the natives. It is not collected as a rule in the wet season. The amount obtained in a single day by a man is estimated by two observers as one kilogramme (2 lbs. 3 ozs.) and by others very much less from 90 to 100 grammes (1,500 grains). A vine about .10 metre ($3\frac{3}{4}$ inches) in diameter at the base gives 200 grammes a year. As is done in the Malay Peninsula, the natives where they find a variety of rubber vines, mix the rubber obtained.

The seeds of *Ecdysanthera*, and one of the unidentified species collected at the end of the dry season took about 2 months to germinate. The seeds should not be covered with soil more than just enough to prevent their being washed away by watering or heavy rain. They require a fair amount of shade, plants unsufficiently protected from the sun being killed. M. ACHARD however prefers propagating these rubber vines by cuttings, and states that the best results were obtained with stems a little thicker than a pencil. Marcottage gave good results but was too troublesome. The growth is said to be rapid and they attain their full growth in six or seven years.

The discovery of any additional rubber producing plants in any part of the world is always interesting, even although their value may not be very great. It is noticeable that none of these new rubber vines as far as identified belong to the genera *Willughbeia* or *Urceola*, which have supplied the best rubbers of the Asiatic forests, but to genera which as rubber producers (*Parameria* excepted) have been quite neglected. The cultivation of rubber vines on a large and profitable scale still offers many difficulties. Many though attaining a large size in the forests, seem to grow slowly and make stems so slender that it is very difficult to see how to extract the rubber except at a prohibitive cost. The methods of extraction from the dry bark may eventually help to solve the difficulty, but the main crux at present is to get the plants to produce large enough stems to be worth the expense of barking. At present the rubber-vines which seem under open cultivation to produce the largest stems are the Landolphias of which several species are very stout and strong growers. The plan of growing these vines in forest more or less thinned is expensive the plants with the forest occupying a large area, and also requiring a great deal of thinning and weeding work. A tree to carry the weight of a really large sized *Willughbeia* must be of large size and is very liable when the vine has attained full size or is approaching it to be strangled, or smothered by the vine itself. The rapidity of growth of a rubber vine under these conditions is not yet determined, and it appears that in many cases where it has been approximately determined it has been very much over rated. Much depends on the amount of light in the forest, and the absence of under growth which would crowd out the young vines, and this in most tropical forests would entail a considerable amount of constant labour.

Most of the rubber obtained from vines is valued at a much lower figure than the best known tree- rubbers, but this may well be due to the adulteration (referred to above) by the native collectors, who put together the rubber of any vine producing it however bad, and is doubtless also due to their carelessness in collecting: still rubber vines have not as yet shewn themselves very tempting to planters.

VOLATILE OILS.

The distillation of volatile oils from plants is in these days a very important branch of chemical industry and the number of plants from which volatile oils are obtained is very large, of these products some are used for scents, others in medicine or for various purposes in the arts. There are a considerable number of plants growing, cultivated or wild, in the Malay Peninsula which produce these oils and probably there remain very many more to be examined and experimented with. At present the oils actually distilled in the Straits are but few in number, and considering the expense of the machinery required to distil on a large scale, perhaps this is not to be wondered at; on the other hand as the Citronella and Lemon grass oils, of Singapore, have been so well known for many years, it is possible that the distillation of these and other useful oils might be profitably increased and even done on a larger scale than at present. It may therefore be of interest to enumerate the local plants which produce oils of economic value and to give some account of them, and in doing so I extract much of these remarks from the work by GILDERMEISTER & HOFFMAN, "The Volatile Oils" written for the well known firm of SCHIMMEL & CO. of Leipzig, and translated into English by E. KREMERS, a work which gives a most complete account of distillation and the products derived. The distillation of oils dates back from very early times, and the methods employed were very simple but gradually improved till within the last few decades there was a very rapid development of the whole industry due at first to the use of steam under pressure, and later to the great development of chemical technology.

The essential oils of plants are secretion products in the cells, or intercellular spaces, or in spiral ducts in various parts of the plants. In some cases the roots, in others, the stems, leaves, seeds or flowers are used. These parts if hard, require to be ground up or crushed before being subjected to the distillation process. The prepared material is put into the distilling apparatus and heated by steam, the vapours saturated with oil-particles are condensed in the cooler and the distillate consisting of water and oil is separated and the oil eventually purified. To this account of distilled oils, I have added some description of the method of extracting the perfumes of flowers with the processes of maceration and enfleurage, as it may be of interest to some readers as showing a possible industry to which attention here has never been paid, and

in writing this I have drawn to a large extent on the best work on the subject, Sawer's Odorographia, which gives a full account of the plants used in perfumery and the methods of extracting the perfumes. The following is a list of essential oil-producing plants from our region. It of course does not include the heavy oils such as that of coco-nut, castor oil or tilseed, which belong to an entirely different class of oils:—

Ferns.—The large elephant fern *Angiopteris evecta,* common in our woods is said by Maiden (Useful Native plants of Australia) to supply an aromatic oil used in the South Sea Islands for scenting coco-nut oil.

Polypodiu phymatodes, L.—One of our commonest ferns occurring on trees and on the ground in open country especially near the sea, is also said to be used in the same way. This fern dried gives out a scent of new-mown hay, and is used here for scenting clothes. A quantity sent to Dr. GRESHOFF was examined by him and reported to contain Coumarin, the aromatic principle of the Tonkin Bean.

Pandanaceæ.—The flowers of *Pandanus fascicularis,* Lam. (*P. odoratissimus,* L.) are used for a scent in India, being macerated in til-seed oil. They have a very strong and powerful odour. The plant is very common along our sea coasts and often planted in villages, where the leaves are used for making mats. The leaves of *Pandanus laevis,* Rumph. "Pandan Jelinkeh" are used often for scent by Malays. They have a fruit and peculiar odour and are used cut up fine with rose water and scraped sandalwood to make a kind of pot-pourri used at marriages. They are also boiled with rice in order to give it a scent.

Grass-oils.—Lemon grass-oil, from *Andropogon citratus,* Dc, has long been manufactured in Singapore, but now chiefly comes from Travancore. The grass is grown in damp fields in rich soil, planted in small tufts, it grows very rapidly and soon covers the ground. The oil is derived from the leaves which are cut in large bundles and put into the still. It is used in native medicine and a little of the grass is often put into native curries, but its greatest use is in making scented soaps. Perhaps more might be done with this manufacture in the Peninsula than is done at present.

Citronella oil is produced by *Andropogon nardus* which is cultivated largely in Ceylon as well as in Singapore, India and Java; it also occurs in East tropical Africa. It is planted in much the same way as the preceding grass, and distilled in the same way. There are two varieties cultivated in Ceylon, one of which is the Straits Settlements plant. This latter is said to produce the best oil. The amount of oil produced in Ceylon is very large, the export in 1899 being quoted at 1,478,756 lbs

In the Ceylon Gardens Report for 1901, the Director says "The export of citronella oil has increased from 1,409,058 to 1,430,168 lbs., but has not yet reached the figures of 1899. The industry is in a very depressed state owing to over-production and adulteration, the latter being so bad that even good local oils do not obtain the value that is really due them. Prices have reached a

very low ebb, $9\frac{1}{2}$ to 10 pieces per lb. and land is going out of cultivation in the grass. On the other hand, the new Java oil, mentioned last year, is selling in increasing quantities at high prices (often 1*s*. 4*d*.) It is not in reality so superior to the best Ceylon oils, as the price would indicate, but it is not adulterated, and has no bad reputation to contend against.

Oil of Vetiver or Cus-cus, *Andropogon muricatus*, Retz., is chiefly obtained from India. In this plant the leaves are scentless and the roots only produce the oil. The oil which is the most viscid of all essential oils is dark brown in colour and seldom exported, but the roots are a regular article of commerce. The oil is used in the finer perfumery. Vetiver grows very well in Singapore, and perhaps might be worth cultivating.

These three grasses as I have elsewhere pointed out may well be grown for the purpose of keeping down weeds in the estate, and when too high can be cut down and either distilled or used merely for mulching, growing compactly as they do especially when cut from time to time they prevent waste parts of the ground from being covered with white weed or other troublesome weeds from growing and scattering their seeds over the plantation. (See also Bulletin 1st Series, No. 8, p. 23.)

Calamus oil is derived from *Acorus Calamus*, L. the Deringu of the Malays, the sweet flag of Europe, belonging to the order (*Araceæ*). It occurs here and there almost all over the world, in temperate and tropical regions. It is often planted by the Malays in and round the villages in damp spots, and is used in native medicine. SAWER in the Odorographia says that the powdered roots is used in England as a toilet powder, and in sachets, and that an oil is distilled from the leaves and roots, that from the leaves is preferable for toilet perfumes and aromatic vinegar. The root-oil is used to improve the flavour of gin and to impart a peculiar taste to beer.

Oil of Zedoary (*Curcuma zerumbet*) is derived from the rhizome of the plant known to the Malays as Temu Lawas. It is commonly cultivated and also half wild here, and is used in curries.

Koempferia rotunda, L., the Chekor, also produces an oil, but it does not appear to be used nowadays.

Ginger oil is obtained from *Zingiber officinale*, Roscoe, and is said to possess the aromatic odour of the rhizome, but is not pungent.

Both the Nutmeg and Mace produce oils, which are said to be almost or quite identical in their properties. The Cinnamon tree of Ceylon is remarkable for producing three distinct kinds of oil, that of the bark, root and leaves. That of the root containing camphor. The Cinnamon tree grows very well in the Straits but the supply from Ceylon at present meets all demands. Cassia oil is obtained from the leaves chiefly of the Chinese Cassia tree *Cinnamomum Cassia*, which is cultivated in China. The tree grows very well in the Gardens in Singapore, attaining a large size. The annual production of Cassia oil varies between two and three thousand piculs. There is another Cassia bark, in Singapore, com-

merce besides the Chinese Cassia bark, which is obtained from Sumatra, and is probably *Cinnamomum Culitlawan*, Bl., and a similar tree occurs in the forests of the Peninsula. Most of the Cinnamons are highly aromatic and possibly several others might be used in place of *C. Cassia*.

Pepper-oil has been distilled from Black Pepper (*Piper nigrum*) for many years. Indeed it is recorded as having been prepared as early as 1574. It is chiefly used medicinally. For some time it was prepared in Singapore where I am informed the natives considered it a specific against cholera. Piperonal or Heliotropine is prepared from white Singapore pepper, in Europe. It has a scent of heliotrope.

Cubebs (*Piper cubeba*) also produces an oil valued in medicine. The cubeb plant was formerly much cultivated in Java and Sumatra (Bulletin 1st Series No. 6, p. 121), and the price of the pepper was very high. It has fallen, however, much in price and the cultivation has pretty well died out of the Straits.

Oil of Betle leaves (*Piper betle*, L.) has been, it appears, repeatedly prepared and investigated, but apparently has been found of little value though it is a somewhat peculiar oil. The leaves of the plant are, as is well known, used for chewing by the Malays with areca nut, and in good demand for this purpose.

Oil of Patchouli (*Pogostemon Patchouli*).—The cultivation of this plant is described in No. 3 of the first Series of Agricultural Bulletin. Although the plant has been introduced into several other parts of the world, it does not seem to have been particularly successful, as the greater portion of the Patchouli of commerce still comes from the Straits Settlements. It is raised from cuttings and when sufficiently tall, cut and dried in the sun. The leaves being either sent home dry or the oil distilled in Singapore. The bulk of Patchouli oil is probably distilled in Europe. It is used exclusively in perfumery.

The oil of the common Lantana (*L. Camara*, L.) has been distilled at Buitenzorg. Its odour is stated to be not particularly pleasant and unfortunately no use has been found for it.

The sweetly scented Lagundi tree *Vitex trifolia* has also been put through the still and produces an aromatic camphor-like oil. It is a common seashore shrub or small tree, with sweet scented leaves, and panicles of violet flowers. It is used medicinally by natives.

Oil of Sweet Basil, *Ocymum basilicum*, L. The "Ruku' of the Malays is a strongly scented little bush, the leaves of which are much valued for scenting clothes and also in medicine. It is commonly planted about villages, and establishes itself readily growing from the seed. I have not heard of the oil being manufactured in the Straits, but it is distilled in Southern France and Spain from the fresh plant. The plant seems to be rather variable, and there are several named varieties and allied species in cultivation, in the East. and the account given in Gildemeister's work seems to show that the oils from different localities have different constituents. This is probably due in part at least to different varieties

being used. The excellent fragrance of these oils renders them very suitable in blending in compound bouquet perfumes and they are said to have a specially excellent effect in the composition of "Mignonette extract" (Sawer Odorographia II, p. 152).

The Camphor oil of the large weed *Blumea balsamifera*, was described in Bulletin 1st series No. 3, having been distilled experimentally in Singapore. It is manufactured in China in Hainan and Canton, and also in Burmah and is used for incense, medicine and scenting Indian Ink. The plant a tall half shrubby composite is often very abundant in waste places and grows to a height of over six feet. The leaves have a strong smell of camphor.

Blumea lacera, Dec. is another weed of the same group, but much smaller. It has also a strong Camphor smell, but little seems to be known as to the value of the oil.

An oil has been distilled at Buitenzorg from the common white-weed (*Ageratum conyzoides*), unfortunately no use has been found for the product of this troublesome weed.

Alyxia stellata, ( )—Is a climbing plant with white sweet scented flowers, deep green shining leaves and black drupes. It is called Pulasari by the Malays and the bark which has a strong scent of Coumarin, is used in native medicine and as a cosmetic. It is quite common about the sea coasts.

Oil of Cloves is obtained by distilling the flower buds of *Eugenia caryophyllata*, Thumb, the clove of commerce. Only the cloves coming from Zanzibar are used, not apparently as being richer in oil than those of Penang or the Mascaren Islands, but because those from these countries have a better appearance and are more valued as spice. The oil is used in perfumery and medicine and other purposes. The stems of the clove flowers also produce an oil which is also distilled but is less highly valued.

Cajeput-oil from the leaves of the Gelam tree *Melaleuca leucadendron*, and its variety *minor*; it is chiefly made in Ceram and Buru. It appears to have been manufactured by the Malays long before the Europeans occupied the Eastern Archipelago. The tree is very abundant in some parts of Malacca and occurs in Singapore and elsewhere, but it is perhaps doubtful as to whether it is a native of the Peninsula or not. It is suggested that it was introduced into the Malay Peninsula by the Dutch, and I have no record of its occurring anywhere but where the Dutch established themselves except in Singapore, where naturally its occurrence as a native plant may be doubted. It however grows very readily and is a useful tree as well as an ornamental one. It attains a height of about 40 feet here, the stem covered with a papery bark of considerable thickness in old trees. This bark is used for caulking boats, and fire lighting, and an attempt has been made to utilise it for making paper in Australia but this it appears was not very successful. The wood is durable and is used also for firewood. The leaves have a strong resinous scent from the oil glands. The distillation of the oil is effected by very simple native stills in the Moluccas and the product shipped in bottles or drums. The greater part of the oil is consumed in India and other parts of the east,

comparatively little being taken in the European markets. It is greenish in colour before being rectified (owing to the use of a copper still) when it becomes clear or yellowish. Some years ago samples of Cajeput oil were made in Malacca from the trees growing there by Mr. DERRY, but for some reason or other the samples did not find favour with the trade, perhaps on account of their colour.

FLOWER SCENTS.

Acacia Farnesiana, Willd. a native of the West Indies, is one of the trees cultivated in the South of France for extracting the perfume of its flowers known as Cassie. The tree or rather shrub has established itself all over the warmer parts of the world and may often be seen on the sea coasts as it prefers open sandy places. It is readily grown from seed and attains a height of about 10 or 12 feet, producing usually abundance of the little yellow balls of blossoms whence the scent is derived, by the processes of maceration and enfleurage. The flowers are macerated in olive oil or purified fat in which they are stirred about and left for a day then strained out, and more put in every day till the oil or fat is saturated with the scent. The pomade is then beaten up with strong alchohol, by machinery in drum-shaped copper cylinders, and after a time is allowed to settle; the fat sinks and the alchohol now containing all the perfume is drawn off. In enfleurage the fat is put on panes of glass in frames like windows and the flowers put on and changed daily, till it is saturated with the scent and then the fat is treated as in the maceration process.

Ylang-ylang oil is obtained from the sweet scented flowers of the Kenanga *Cananga adorata*, Rumph, a big tree belonging to the order *Anonaceæ*. The oil is distilled in the Philippines and Java only, though the tree is common in cultivation in the Straits Settlements and could be planted to any extent. The tree is raised easily from seed, and attains the height of 50 or 60 feet with a smooth stem. It is probably native in Tenasserim, but I have not seen an ything to show that it is wild in the Malay Peninsula. The flowers are large about 4 inches across, with six lanceolate green petals becoming yellow when fully opened. During distillation two oils are obtained, the first that comes over is ylang-ylang, the second known as Cananga oil, the former being the finest. The amount of oil produced by the distillation is rather small being about ½ per cent. It is much used for hair oil, and perfumery and the Macassar Hair oil is said to consist of the flowers of Cananga and Champaca macerated in coconut oil (Guibourt Comptes Rendus, 1873).

Ylang-Ylang.—"The Ylang-Ylang, or sometimes spelled Ilang-Ilang, while indigenous to many parts of tropical Asia, reaches its greatest perfection in the Philippine Islands, where it is a favorite among the natives. Besides its value as an attar in preparation for the hair and toilet waters, it is also claimed to possess curative virtues in tooth and other aches and pains. In a preparation of

coco-nut oil known to commerce as Macassar oil, for the hair, attar of Ylang-Ylang is the perfume.

The perfumers of Europe and to a less degree the United States make it the base of some of their most costly extracts. The Manila oil is practically without competition in the markets of the western nations on account of superiority and at from $40 to $55 a pound is unequal to the demand.

Hitherto, the United States supply has come through Germany or France. Together with England, those countries have a monopoly of the product which is generally secured in advance under contract for the entire output.

The tree common to many localities south of Manila, is found chiefly in the well populated provinces and islands, it being said to thrive best near the habitations of man. The propagation in plantations by seed or cuttings about 20 feet apart, each way (108 trees to the acre), is easy and the growth rapid in almost any soil. The first flowers appear in the third, the eight year yielding often as high as 100 lbs., the bloom occurring in every month. The greatest yield is from July to December.

The process of converting the long, greenish-yellow fragrant petals of the flower into essence is by the simplest form of distillation, no chemicals of any kind being required, simply water and the choicest flowers. The oil will vaporize in a closed boiler at 220°. The usual results follow.

The best quality must be clear as distilled water and fragrant. The second quality is yellowish and smoky. The oil is drawn from the bottom of a glass separator, the water remaining. The oil is filtered through talcum and ready for the market, being packed in glass bottles and commands ready purchasers.

About 75 lbs. of flowers yield one pound of oil. Flowers are worth from 8 to 15 gold per pound, the cost of manufacture is placed at $4 a pound. The yield in the case of attar of roses is small, 150 lbs. of rose leaves producing but one ounce of oil.

There are flowering groves in many parts of southern Luzon and the Visayan Islands which may be leased. The vicinity of Manila is particularly well adapted to the growth of this valuable tree."

Pharmaceutical Review, Vol. 20, No. 4.

Artabotrys odoratissimus.--A climbing plant often cultivated by the Chinese for its sweetly scented green flowers, much smaller than those of the Cananga, belongs to the same order, and has somewhat similar scent. It is hardly floriferous enough to be worth cultivating for the extraction of the scent.

The beautiful flowers of the Ceylon iron-wood tree, Matopus of the Malays (*Mesua ferrea*), belonging to the order *Guttiferæ*, are often sold dried in our local drug shops, being used in medicine and cosmetics. They are deliciously scented and are used for satchets etc., in India. The oil has been extracted, but does not appear to have been ever brought into trade. The tree which is very ornamental is a native of the Malay Peninsula but not very common.

The Champaca (*Michelia Champaca* L.) of the order of Magnoliaceæ, is very commonly cultivated by natives for its deliciously scented yellow flowers. It is grown from seed and forms a tree of fairly large size, flowering most of the year abundantly. The oil of Champaca seems to be but seldom distilled. It is indeed very costly (Gildemeister). Its scent is said to resemble that of *Acacia Farnesiana*, reminding also of violet and ylang-ylang. The tree is very popular with natives, who was fond of putting the flowers in their hair, and there should be no difficulty in procuring enough in a short time for extraction of the oil, should the demand be great enough. The white Champaca, is more floriferous and the flowers more strongly scented. It is the *Michelia longifolia*, Bl. According to Gildermeister the oil is very volatile and is scented like Basil.

Aglaia odorata Lour.—Is a small bushy tree commonly grown in our Gardens and introduced from China. It has small dark green leaves, and panicles of very small yellow fragrant flowers. These flowers are used by the Chinese for scenting tea and in the composition of Joss-sticks. The oil seems never to have been prepared but it could probably be extracted by maceration or enfleurage, as suggested in Sawer's Odorographia. The scent is very sweet and delicious.

There are a number of other sweet scented flowers which might be obtained here in sufficient quantity to be used in extracting the perfumes or which could be readily cultivated for the purpose. Such are the Frangipani, (*Plumiera*) the Bunga Tanjong (*Mimusops Elengi*), the Tonkin creeper, (*Pergularia*), the Betel nut (*Areca Catechu*), Pandanus, and the tuberose.

H. N. R.

BRUCEA SUMATRANA.

The interest in this new drug mentioned in Bulletin No. 3, p. 122, has by no means abated, and applications for its seeds still come from Europe and elsewhere. An important article quoted below on its use and properties has been published by E. MERCK, of Darmstadt in his Annual Report, and I take this opportunity of giving a full account of the plant:

Brucea Sumatrana, Roxb. is a small shrub belonging to the order *Simarubeæ*. It attains the height of about 6 or 8 feet with long slender white-barked stems, when grown in shade, grown in the open and pruned back it becomes more bushy and shorter with larger leaves. The leaves are pinnate with four pairs of leaflets opposite and petioled and a terminal one. The pairs of leaflets are about an inch apart, soft lanceolate acuminate and crenate, about 3 inches long and 1½ inch wide, dark green above and paler beneath, softly hairy on both surfaces especially on the nerves. The whole leaf is about 8 inches long. The flowers are borne in slender racemes about 1¾ to a foot long, in the axils of the leaves. They are very small about 1/16th inch across, with 4 minute oblong petals, and 4 larger oblong petals, both deep red. The 4 stamens are very

short, the deep red anthers almost sessile. The ovary is large for the size of the flower, bright green, of 4 or 5 lobes, with 4 or 5 recurved linear green styles. Of the 4 or 5 lobes of the ovary one, two or three develop into black drupes, elliptic in outline and about $\frac{1}{4}$ inch long. They have a little greenish almost tasteless flesh round the single seed which has a thin brittle coat covering the exceedingly bitter embryo. The taste is much the same as that of quinine or of the bark of the allied plant *Eurycoma longifolia,* the Bidara Pahit of the Malay Peninsula.

The plant occurs in Pahang, Malacca, Sungei Ujong and Selangor, and probably in suitable places all over the Peninsula. It was collected by WALLICH in Singapore when the island was first occupied in 1822, but seems to have quite disappeared, probably on account of clearing and building on the south coast of the island, where WALLICH collected many of his plants, and which was then probably a suitable locality for it. In 1891 I brought seed from Pahang and planted it in the Botanic Gardens. From these plants the species has spread all over the Tanglin district in waste open ground, the birds having carried and distributed the seeds around the gardens, so that it has become quite abundant again.

It has also been collected in Tenasserim, Siam and all the larger Malay islands as far as Philippines, in South China and Australia. The plant is usually to be found in flat open country, never in forest, in rather sandy and dry spots, and flowers and fruits all the year round. It is propagated by seed and it appears that the seed should be dried before planting and sprinkled on the ground, not buried. Attempts to propagate it by cuttings have not been very successful, as even after the cuttings have sprouted the plants are apt to damp off. In long grass it is apt to grow weak and slender and should then be pruned back so as to cause it to branch and become bushy.

The plant is known to the Malays as Cherek Jantan, Sisik Manik, Malau or Embalau Padang, and Malau Betina, Sarai Pusur, Sejarat, Ampadu Bruang.

Sumatran,—Malur, Tambar bui, Tambar Sipogo; Javanese—Kualut, Wonglot, Katilang, Ketileng; Sundanese—Kandong Penchang; Jacatra—Kemon jenjeny; Moluccas—Lusa or Nusa Rajah, Kayu Nagas; Celebes—Tambara Maritja; Banka—Beliliek; China—Kosam.

USES.

RUMPHIUS gives a good figure and an account of the plant in the Herbarium Amboinense Vol. VII p. 29, Plate XV, and recommends the use of the root as an antidote to poison or bad food. HORSFIELD Verh. Bat. Gen. Dl. VII. recommends an infusion for debility of the stomach and diarhœa, and as a tonic. An account and figure of the plant is given by GRESHOFF (Nuttige Indische Planten ii. p. 71.) He states that the seeds are well known in Europe under the name of Macassar kernels and quotes from N. P. VAN DER STOK in Gen. Tijsch. v. Ned. Ind. XVI, 370, as to its use in dysentery, and from Dr. C. L. VAN DER BURG (de Gen-

eesheer in Ned. Ind. III, 143), who states that it is not only valuable in dysentery but also in chronic diarrhœa and sprue.

The Malays of the Peninsula chew the roots with betelnut in cases of cough, and boil the roots and drink the decoction for rheumatism and fever. The Javanese say that in Java the leaves are cut up and smoked with opium for, apparently, no other reason than that they taste like opium.

"This drug, which is little known in Europe though for ages used by Chinese doctors and praised as an anti-dysenteric, was first noted by DYBOWSKYE E. HECKEL and FR. SCHLAGDENHAUFFEN, have subsequently identified the drug botanically and subjected it to exact chemical analysis. The latter detected, in addition to a considerable proportion of fatty oils, the presence of the following active constituents, *viz.*:—quassin, saponin and another bitter substance distinct from quassin. BERTRAND and PHISALIX have arrived at the conclusion that the efficacy of the Kosam drug is due to cosamin, a glucoside peculiar to it and soluble in water and dilute alcohol. According to PHISALIX this glucoside induces in mammals at first a retardation of the respiratory movements subsequently vomiting and diarrhoea. Death is attended by paralytic symptoms and coma. The *post-mortem* examination disclosed a diffuse inflamation of the digestive canal and the kidney, also hyperleucocytosis accompanied by partial destruction of the leucocytes. The minimum lethal dose of cosamin introduced intravenously amounts to 0·25 grm. (grs. 4) per kilo (lb. $\frac{1}{25}$). In the case of subcutaneous injection this dose is twice as large. Administered in small doses, cosamin is an emeto-cathartic and cholagogue and appears to have a detrimental effect upon the nematodes and taenias of dogs, at the same time, it exercises a mildly microbicidal action. A characteristic feature of the preparation consists, however, in its previously mentioned elective action upon the kidneys, and the mucous membranes of the mouth and intestine. MOUGEOT has administered the drug in 8·79 cases of tropical dysentery and secured a complete cure in 7·99 cases within 3-6 days, in 57 cases recovery resulted after a lapse of 14 days, whilst 15 excessively enfeebled and apparently stationary patients had to be sent home. Only 8 cases could be recorded as complete failures. Similarly, Cocnacq found that in fresh cases of acute, as well as chronic noninveterate cases of dysentery the drug plays the part of a specific. Chronic dysentery of several years standing was not modified by it. Particular importance attaches to the hæmostyptic properties of Kosam, and its cholagogic action is worthy of note. The properties of Kosam have a general resemblance to those of the infusion of Ipecacuanha, its action sets in, however, much more energetically and promptly. The ordinary dose of the drug amounts to 12 seeds on the first day, 10 on the second, 8 on the third day of the treatment. Owing to the fact that the seeds if not divested of their fatty constituents induce vomiting it is advisable to extract the latter before using the seeds. Taking the average proportion of the fatty constituents to be 50 % the dose appropriate for the fresh seeds deprived of their fat is reduced accordingly to one half

of the quantity stated above. (*See* also Eug. Collin, sur le vrai et le faux Ko-sam, Journal de Pharmacie et de Chimie, 1900, II, p. 190)."

Merck's Annual Report for 1901, p. 177.

A BLACK ROT DISEASE OF GINGER IN JAMAICA.

A fungal disease of Ginger is reported by Mr. HOWARD from Jamaica in the Jamaica Bulletin (November and December, 1901, and February, 1902). The fungus travels underground by means of rhizomorphs black root-like bodies, and penetrates the rhizomes of the ginger, appearing like black lines in the rhizome. The diseased plants should be burnt, and the ground in which the disease appears should be isolated by trenches, only healthy rhizomes should be planted and they should be soaked for a few hours in Bordeaux mixture.

ROUCHERIA GRIFFITHIANA.

Some time ago in reply to a request by Dr. GRESHOFF, of Haarlem, a quantity of the bark of *Roucheria Griffithiana,* Akar Ipoh Putih of the Malays was sent for analysis. The plant is a stout climber with whitish bark, lanceolate dark green leaves, and an abundance of small yellow flowers followed by small red drupes. It climbs by means of peculiar hooks which thicken as they get a hold on the neighbouring vegetation. It belongs to the order *Lineæ,* and is very abundant all over the Peninsula. The bark is used by the Sakais in the preparation of their poison for the blow-pipe darts, and as they state that it is effective as a poison it was desirable that it should be examined.

The analysis was made by Dr. J. SACH, of Gottinger and is published as an Inaugural Dissertation. From the bark he extracted a crystalline substance, a cholesterin, known as Lupeol.

Dr. SHERMANS REPORT ON GUTTA PERCHA.

A copy of this interesting report has been received at the Botanic Gardens Library. It has been already referred to in the last number of the bulletin through an extract from the India Rubber World, but no mention was made to the excellent series of photographs no less than thirtysix in number with which it is illustrated. The photographs represent trees, leaves fruit etc., of *Dichopsis Gutta, Payena Leerii, Hevea Braziliensis, Castilloa Elastica, Ficus elastica* and *Willughbeia firma* and *W. tenuiflora.* Twenty of these photographs were taken in the Botanic Gardens and Forests of Singapore and Penang, and the rest in the Botanic Gardens of Buitenzorg.

GERMAN COLONIAL ENTERPRISE.

Translation of an extract from the Preface to the first issue of the German monthly paper for Tropical Agriculture, "the Tropen Pflanzer" 6th year, No. 1, January, 1902.

The difficult economical situation which has become so marked in German Industry and German Trade has had a decidedly paralysing influence upon enterprise on a large scale in our tropical Colonies; still a few Estate Companies have been founded during the past year tho' each only with a capital of £15,000, their financial situation therefore not appearing very brilliant. Also the Southwest African Stock-breeding, with a capital of £25,000 is a creation of the last year; but it must not be forgotten that this would have never been achieved without considerable support from the Colonial Society.

There is no doubt that the East African Coffee Estates as well as the Cocoa Estates of Kameroon will have to face very bad times. Most of these Companies have, in the hope of early dividends planted far too quickly and have now, at the most unfortunate moment reached the end of their funds. Add to this a number of mistakes made: Coffee planters in Umsambare have planted freely away without troubling their heads about the depth of the soil; the consequence is that whole fields are dying out. Most serious, finally are the consequences of having formerly underestimated certain expenditure.

In Kameroon the greatest drawbacks are the difficulty of obtaining labour, and the heavy cost and bad quality of the labour obtainable. If the labour question cannot soon be settled in a manner more satisfactory than heretofore by the combined efforts of all concerned, we have the most serious fears that, notwithstanding all the advantages of climate and soil in the Kameroon Mountains, a profitable cultivation of Cocoa on a large scale will not be possible.

The cultivation of Castilloa Rubber cannot be recommended, as the caterpillar of a large beetle will gnaw into the bark of the young trees thereby killing them. As on one Estate experiments with this plant have been made on a large scale we hope to hear soon more about the amount of damage done by this pest and about the means of combating it. The growth of Castilloa as well as of the indigenous Kickxia leaves nothing to be desired. We have no reports yet how Hevea Brasiliensis and Ficus elastica, which seems to do well, behave when grown on a large scale.

The few Estates with Liberian Coffee and Coconuts in German East Africa progress steadily and favourably. The same can unfortunately not be said about the Estates with Coffee arabica. Newly discovered tho' yet unknown animal pests of different kinds seem to do enormous damage to those Estates and not knowing the ways of these pests planters have no means of combating them. It is high time that a Plant-Pathologist should visit these Estates to make experiments before it may be too late. The Colonial Economy-Committee deserves praise for having first indicated the right course; the news just only reaches us that Prof. Zimmermann, who was for many years the chief of the Department for Coffee at the Botanical Gardens of Buitenzorg, a noted connoisseur of the enemies of the Coffee plant, is already on his way to German East Africa. Tho' the most urgently wanted work has thus been

done for a time, is to be hoped that a Plant-Pathologist will be allowed by Parliament for this District.

Everyone who knows the Tropics will understand the enormous importance of the proposed Botanical Garden and Laboratory in Amani, Usambare, for the economical development of German East Africa.

The future of the Cotton cultivation in Togo depends almost entirely upon the yet unsettled question of transport for at present almost all cattle perish on the way from the coast to Tove. The only way out of this difficulty is through building a railway and if anywhere in a German Colony a railway is to have, economically, a future, it must be the one from Lome to the Agu and Mixsahohe Districts as by it a densely populated and productive district will be opened.

The development of German Southwest Africa will be much aided by the railway to Windhoek now under construction, and this country will have to look towards the breeding of cattle and mining as its chief industries. For the former the boring of wells is of paramount importance and a good deal in this direction has been done by the Colonial Economical Committee.

Thanks are due to the Government for the creation of a Forest Department at Windhoek.

In New Guinea, we hear, the cultivation of Tobacco is to be abandoned totally as not paying. The cultivation of Castilloa, Ficus elastica and Hevea seem to progress favourably. The New Guinea Co. is about to take up the cultivation of Gutta Percha and there is no doubt that the expedition organised by our Society and the cuttings brought by it to our Colonies has had much to do with the introduction there of this important cultivation.

The coconut is bound to remain the main article of the Southern Seas and the European Companies cultivating it are continually extending their acreage.

In Samoa a fair start has been made with Cocoa; the excellent Cotton however which grows there has been totally abandoned on account of the uncertainty of the crops and the difficulty of getting labour in Samoa as well as in New Guinea and the Bismarck Achipelago. The New Guinea Co. propose to pay more attention to Liberian Coffee and Cocoa; the samples of Liberian Coffee from there have brought good prices. The experiments with Ramie were a failure owing to a beetle which consumed the leaves of the plants.

During the coming years a good deal of attention, on the part of the Government as well as of Companies will have to be devoted to cultivations by Natives. As the Natives, of their own impulse, will always grow only as much as they require themselves, we must lead them to cultivate more with a view of exporting their goods. Such an extention of the cultivation can be accomplished in two ways, through compulsion and through augmenting the needs of the Natives.

All these question which are of fundamental interest for our Colonies afford a large field for work to this Periodical as well as to

the Colonial Economical Committee; sooner or later we must succeed in procuring from German Colonies most of the tropical produce required by Germany.

Finally we must mention the colonisation of the mountain districts in our Colonies: The time for introducing German Farmers has not yet come; we must begin by experimenting with the breeding of cattle and at the same time introducing Hill cultivation, like Coca, Cinchona, Tea, &c. As private enterprise is not likely to undertake such experiments, it is the duty of Government to smooth the way by starting small experimental plantations.

W. R. R.

17th May, 1902.

SOIL ANALYSIS.

Results of an Analysis made at the Imperial and Royal Agricultural-Chemical Experimental Station at Vienna, Austria; by Director Dr. DAFERT, of soil taken from Perhentian Tinggi Estate, Negri Sembilan; the Estate is situated about 16 miles from the sea, on the watershed of rivers Linggi to the West and Rembau to the East, at the southern extremity of the Gunong Angsi range, at an elevation of about 500 feet above the sea.

		Water.	Loss in burning.	Insoluble in Muriatic acid.	Phosphoric acid.	Potash.	Nitrogen.
Sample from jungle adjoining:							
Field No.	1	3·54	11·58	85·8	·07	·24	·22
,,	2	4·20	17·75	73·8	·07	·16	·23
,,	3	2·98	7·17	93·4	·04	·20	·14
,,	4	2·48	7·08	91·4	·05	·21	·10
,,	5	2·93	8·81	88·6	·06	·11	·13
Sample from fields which had been opened from 5 to 3 years:							
Field No.	1	1·35	6·31	92.0	·08	·23	·08
,,	2	4·20	17·78	71·4	·01	.08	·17
,,	3	5·79	2·63	93·8	·09	·15	·07
,,	4	2·10	8·82	93·6	·09	·21	·11
,,	5	1·80	8·36	85·6	·07	·14	·11

CORRESPONDENCE.

COCO-NUTS.

PERMATANG ESTATE,
JUGRA.
Selangor, 24th April, 1902.

The Editor
AGRICULTURAL BULLETIN.

Dear Sir,

It is gratifying to notice by recent correspondence appearing in your paper that interest is at last being aroused amongst

planters in the discussion of the many details concerning Coco-nut cultivation by Europeans, and the figures given by Mr. CAREY in his letter of 15th February, will no doubt be of interest, and serve as food for reflection to those (and there are many) who ridicule the idea of any such returns being possible.

I know very well the little "patch" to which Mr. CAREY refers, and it is to my mind also in no way an exceptionally fine one. Having visited Ceylon, and some of the Estates there, I am very firm in my belief, that no matter what they possess as regards climatic conditions, and soil requisite for successful coco-nut cultivation, we can go, at least one better here: at any rate in the coast districts.

Careful cultivation, regular weeding, and protection from insect pests, should do much to bring about a result such as Mr. CAREY anticipates.

It has long occurred to me that the question of how to prevent, and deal with unproductive trees is one that all those interested in this particular cultivation will be glad to see discussed, and a good deal of attention given to.

I may be challenged to show the existence of these to any large extent on an Estate under intelligent and able supervision. I know it to be so in nearly all native plantations both in this and other districts where I have had the opportunity of observing the trees closely. It appears to be quite an accepted theory in these parts that seed should be taken from trees not younger than 15 years, and the fact may be interesting to some that almost every Malay to whom I have spoken on the subject, attributes the cause of these non-bearing trees to the non-adherence to the popular belief. In planting up a large area, it cannot always be ascertained exactly where the seed comes from, so that, I think, unless very great care is exercised in this direction. We must not be disappointed if the average on a well cared-for estate turns out to be quite as high as that mentioned by Mr. CAREY on what was formerly a native holding.

How to make these unproductive trees, productive (if it can be done at all) is a matter on which, I am sure the views of every one will be welcome.

Yours faithfully,
ROBT. W. MUNRO.

COCO-NUTS.

JUGRA ESTATE,
SELANGOR, *15th April, 1902.*

Dear Sir,

When I was last in Klang, I was sorry to find that Coco-nuts had lost some of their popularity amongst European planters. So far as I could learn, the "Prince of Palms" was under a cloud, chiefly on account of certain remarks made by a Malay Rajah and two Ceylon planters who had been visiting Klang.

The Rajah whose claim for immortality rests, perhaps, rather on his prowess on the field of battle than on his system of upkeeping cultivation, stated that in spite of the most tender solicitude, coco-nuts would not thrive in this country.

The gentlemen from Ceylon, it is said, told even a worse tale. The coco-nut is not only ungrateful—it is treacherous. It will come into bearing at about ten years of age, promise well, lead its owner into marriage and other reckless extravagance; and then, at about fifteen years of age, leave off, or almost leave off, bearing nuts.

I have no doubt that reasons, figures, etc. can and will be given to support this charge, but I think that the Sungei Rabats Orchards will take a good deal of explaining away with any argument less convincing than an axe. These orchards were the first planted in the Kwala Langat district and the Coco-nuts were in bearing for years when the late Sir ANDREW CLARKE paid his historical visit to the late Sultan ABDUL SAMAD at Jugra in 1874. Some of the Coco-nuts were planted by a man named Udin at the time of his daughter's marriage to Berkat. This is the earliest planting I can trace—though it was not the first. Udin's daughter died last month. Her age is registered at the Jugra Office at 79; but this is probably a fancy figure. At all event she was a very old woman and her grand children are extremely numerous and of very varied ages. I bought the trees which were planted during this lady's girlhood from her son, Lakim *bin* Berkat, three years ago.

At that time, the orchards had been totally deserted for nine years and I expect that the condition of the Klanang "holding" which you describe in Agricultural Bulletin No. 6, was high class cultivation as compared to that of any produce. I felled the jungle, dug out three acres of lalang, drained the land and now weed it regularly. I have picked sufficient nuts not only to pay for this work but to recover the cost of the purchase. Some of the trees yield upwards of a hundred nuts per annum and practically, it is only those trees which were planted within a few years of abandonment that make no return or are likely to make no return in the near future. It is impossible to give an average, because I have never counted the trees. It is difficult, owing to the system of planting. For instance, I find four stems growing out of a common mound, each stem in bearing. Should it be counted as one or four trees? Perhaps some Malay put them there to eat but fell asleep and forgot about them.

I have heard somewhere that it is injurious to cut steps up a coco-nut tree. All the trees which are of any considerable age in our orchards have been so treated and some have been hacked about so wantonly that one wonders why they do not break down in the first high wind.

Yours faithfully,

CYRIL E. S. BAXENDALE.

P. S.—I expect to plant another 50 acre field with coco-nuts this month.

(I think that there are a good many other would be planters who recklessly condemn a cultivation because they are ignorant of it, besides the Malay Rajah and the Ceylon gentlemen. Coco-nuts like all other plants want to be put in the right soil and treated properly before they abstain from playing tricks such as are mentioned in this letter. The superb plantations of Coco-nuts all over the Peninsula are quite a sufficient reply to these sceptical persons.

With respect to the four stems growing out of one mound, I should incline to accept the correspondent's theory that four nuts were by some accident put together. Coco-nuts are often found with two or three stems which is due to the fact that the ovary of the flower is normally three celled with an ovule in each cell, but it is only in exceptional cases that more than one ovule develops. Coco-nut palms however often branch, but usually above ground and generally possess but two main stems which branch again and again.

As to the injury by cutting steps in coco-nut palms I have never seen any bad result so long as the cuts are made in the usual shallow way. (Ed.)

FICUS ELASTICA.

To the Editor,

AGRICULTURAL BULLETIN,

Dear Sir,—I should like to elicit the opinio ns of those of your readers who are interested in the cultivation of Rembong (Ficus elastica) as to the best age and extent, to which young plants should be pruned. In the case of plants 3 to 4 feet high, the fact of cutting off young shoots is, in my experience, a sure means of retarding, at least temporarily, the growth of the tree. From what I have seen of trees 4 or 5 years old I should say that it is still a very open question, expecially where high winds are prevalent, as to whether it is advisable to cut off the lower branches, as, until the aerial roots are well established, the tree proves itself very liable to topple over in a gale of wind.

Yours faithfully,

A. IRVING.

NOTICE.

(1).

The Para-rubber trees in the Botanic Gardens, Singapore, are now commencing to produce the seed crop. Planters who have put their names down in previous years for seed, and on longer want any are requested to write to the Director to inform him.

(2).

Correspondents acknowledging the receipt of Bulletins are requested to Stamp their letters fully, as a large number of letters have been received from various parts of the world either not stamped at all, or insufficiently stamped.

(3).

All applications for Bulletins should be made to the Editor.

SINGAPORE MARKET REPORT.

April, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	33.00	32.00
Bali	50	24.00	24.00
Liberian	347	19.50	18.25
Copra	3,770	10.25	8.75
Gambier	2,800	13.15	11.85
Cube Gambier, Nos. 1 & 2	30	20.50	15.75
Gutta Percha, 1st quality	...	500.00	350.00
Medium	...	350.00	200.00
Lower	...	200.00	50.00
Borneo Rubber	...	134.00	72.00
Gutta Jelutong	...	5.75	5.25
Nutmegs, No. 1	...	49.00	48.00
No. 2	...	72.00	70.00
Mace, Banda	...	105.00	85.00
Amboyna	...	78.00	73.00
Pepper, Black	669	32.75½	31.50
White	135	54.00	52.00
Pearl Sago, Fair	150	5.00	4.50
Medium	...	5.00	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	2,930	3.75	3.50
No. 2	150	1.85	1.75
Flake Tapioca, Small	610	6.75	5.15
Medium	...	6.00	5.25
Pearl Tapioca, Small	533	6.87½	5.30
Medium	1,080	7.00	4.90
Bullet	...	6.75	6.00
Tin	2,660	89.00	76.75

London Market.

Arrowroot.—Very quiet. At auction Bermuda was bought in at 1*s*. 4*d*. to 1*s*. 8*d*. per lb. and all the St. Vincents at 2⅛*d*. to 3¾*d*. for good to fine.

Oil, Camphor.—Is very scarce, one holder quoting 45*s*. per cwt. c. i. f.

Oil, Castor.—Is slow of sale with a small business in Calcutta seconds at $2\frac{3}{8}$*d*. per lb.

Benzoin.—Sumatra was neglected in auction, only 2 cases selling at £7. 2*s*. 6*d*. per cwt. for good seconds, with small to bold almonds and rather false packed. For a case of small to bold palish free Siam almonds of good flavour £19. per cwt. was refused, £22. being wanted, and for partly blocky, pea and bean size, £7. 15*s*. was refused.

Cardamoms.—Sold at very irregular prices, bold being steady, and medium and small sizes easier. Decorticated seeds were in good demand, and sold at firm rates, 1*s*. 6*d*. to 1*s*. 7*d*. being paid. The following prices were paid for Ceylon-Mysores: Good bold pale bright, 2*s*. 11*d*. to 3*s*. bold and medium pale, 2*s*. 7*d*. to 2*s*. 11*d*., bold medium pale, 2*s*. 2*d*. to 2*s*. 3*d*.; small and medium palish, 1*s*. 8*d*. to 2*s*. small pale, 1*s*. to 1*s*. 1*d*., splits, medium, 1*s*. 1*d*., brown split and pickings, 1*s*. 1*d*. to 1*s*. 4*d*. Ceylon-Malabar pickings, 4*d*. per lb. subject, and broken decorticated Malabar seed, 1*s*. 2*d*. Of 7 cases native wild long offered 1 case of small to bold sold at 2*s*. 9*d*. and 5 cases medium and leaner ditto at 2*s*. 3*d*. to 2*s*. 4*d*. subject.

Coca-Leaves.—A case of good green Ceylon realised 1*s*. 1*d*. fair greenish, 9*d*. and slightly damaged, $6\frac{1}{2}$*d*. per lb. Privately, green Truxillo-leaves are quoted 9*d*. per lb. spot.

Ipecacuanha.—Holders were rather firmer in their ideas of value for Cartagena, 4*s*. 3*d*. being the "stand-out" prices; but no business was done publicly at this figure, and bids of 4*s*. were to be submitted for a few bales. Rio root was slightly easier. 9*s*. 6*d*. to 9*s*. 9*d*. per lb. being paid for fair lean to bold root; for good bright natural 9*s*. 10*d*. was wanted. Five bales of sea-damaged sold at from 8*s*. 7*d*. up to 9*s*. 4*d*. per lb. according to damage. Cultivated Rio was held at 9*s*. 9*d*.

Kola.—A barrel of small, partly shrivelled, West Indian sold at 2*d*. per lb., 3*d*. was refused for medium to bold bright West Indian, $3\frac{1}{2}$*d*. being wanted.

Oil, Lemongrass.—Privately 6*d*. per oz. is quoted on the spot, and $5\frac{1}{16}$*d*. c. i. f.

Oil, Lime.—Sold at unchanged rates, 1*s*. 6*d*. per lb. (no allowance for draft or trett) being paid for 4 cases of West Indian distilled.

Spices.—Continue remarkably slow, and business is of only a retail character. At auction on Wednesday all the parcels of Cochin Ginger offered were bought in; cuttings and small rough at 40*s*., washed rough at 40*s*. to 42*s*., Calicut brown rough at 42*s*., bold rough slightly limed at 50*s*., unassorted native cut at 60*s*., and bold roughly cut at 70*s*. per cwt. Japan is selling privately at 32*s*. 6*d*. per cwt for ordinary rough limed. Penang Cloves were bought in at 8*d*. per lb. for fair red. Zanzibar are very quiet, but steady at $3\frac{13}{16}$*d*. per lb. for June-August delivery. Stems were bought in at $1\frac{1}{4}$*d*. per lb. Chillies were

bought in at 32*s.* per cwt. for long red picked; a small lot of ordinary sold at 31*s.* East India Capsicums were bought in at 25*s.* per cwt. for cherries, and at 22*s.* for long on stalk.. Pimento neglected and bought in at 3*d.* to $3\frac{1}{8}$*d.* per lb. Mace quiet; middling pale Penang was taken out at 1*s.* 8*d.* per lb. Black Pepper slow, but unchanged in price, Singapore being quoted $5\frac{5}{8}$*d.* per lb. on the spot, and $5\frac{3}{4}$*d.* to arrive; good Lampong was bought in at 6*d.* and Penang at $5\frac{3}{4}$*d.* per lb. East India estate grown sold at $5\frac{1}{2}$*d.* to $5\frac{5}{8}$*d.* per lb. Very fine bold picked Tellicherry white sold at 1*s.* $7\frac{1}{2}$*d.* per lb. and fine coriander with red eye at 1*s.* $4\frac{3}{4}$*d.* the pickings bringing $8\frac{5}{8}$*d.* to 11*d.* per lb. Fine Singapore was bought in at 1*s.* and good at $10\frac{3}{4}$*d.* Fair quality to arrive has been sold at $9\frac{5}{8}$*d.* Penang is unchanged at $9\frac{1}{4}$*d.* on the spot, and 9*d.* for shipment.

The Chemist and Druggist, May 3, 1902.

COFFEE.

(PER MAIL ADVICES OF APRIL 18TH, 1902.)

The London Commercial Record says:—The market during the past week has shown much irregularity. Good to fine East India suitable for the home trade met good competition and sold at very full prices, but low middling descriptions were neglected and nearly all withdrawn. Ceylon met practically no demand. Jamaica was dull of sale at a reduction of 1*s.* to 2*s.* per cwt. Costa Rica generally was in good demand and fully previous rates were paid. Other Central American descriptions show no material change. Yesterday, owing to the poor light prevailing, the catalogues issued for auction had to be postponed. The market for "futures" has been weaker owing to large Brazilian receipts, and prices show a further reduction of $10\frac{1}{2}$*d.* to 1*s.* per cwt. yesterday Santos for May delivery sold at 28*s.* 9*d.*, July at 29*s.* 6*d.* September at 30*s.* $1\frac{1}{2}$*d.* to 29*s.* $10\frac{1}{2}$*d.* December at 31*s.* to 30*s.* 9*d.* and March at 31*s.* 6*d.* To-day the sales passed off with slow demand, and in many cases 6*d.* to 1*s.* per cwt. decline. The supplies brought to the hammer summed up to 5,272 bags 293 barrels, the great bulk being Costa Rica.

Brazil "futures" valued as follows:—May 28*s.* 6*d.* July 29*s.* September 29*s.* 9*d.* December 30*s.* 6*d.* March 31*s.* 3*d.*; Receipts.—Rio 15,000. Santos 26,000, Exchange $12\frac{1}{16}$. Havre $\frac{3}{4}$ to $\frac{1}{2}$ down.

Hamburg $\frac{1}{4}$ lower. New York 5 lower. We quote:—

London	- Santos	- July delivery	- 29*s.* 6*d.*
New York	- No. 7 Rio	- ,,	- 5.20 cents.
Hamburg	- Santos	- ,,	- $29\frac{1}{2}$ pf.
Havre	- Santos	- ,,	- 36 francs.

Imports, Deliveries and Stock of Coffee in London are as follows:—

	Stock.		Imports.	
	1902.	1901.	1902	1901
Tons ...	19,985	18,532	16,332.	16,955.

	Home Consumption		Export.	
	1902.	1901	1902.	1901.
Tons	5,689	6,411	2,808	6,995

The preceding figures exhibit—	Tons.
In the Imports a decrease this year of - -	- 623
Home Consumption a decrease of - -	- 722
Export a decrease of - - - - -	4,187
Stock an increase of - - - - -	1,453

The details of the week's auctions are as under :—

Ceylon.—Plantation—Of 18 casks 8 tierces 13 barrels 7 bags a small part sold-good brownish colory 55*s*, good middling 100*s*. 6*d*. good bold. East India—2,101 bags partly sold as follows :—Mysore, smalls 43*s*. 6*d*. to 54*s*., low middling 55*s*, 6*d*., good to fine middling 69*s*. 6*d*. to 80*s*., common to fine bold 71*s*. to 105*s*., peaberry 84*s*. to 105*s*., Coorg, smalls 46*s*. 6*d*. to 50*s*., middling 54*s*.; Neilgherry, smalls 44*s*. bold 86*s*. 6*d*., Wynard, smalls 44*s*. to 47*s*. 6*d*., low to good middling 40*s*. 6*d*. to 60*s*., peaberry 52*s*. to 57*d*, Peermade, smalls 30*s*. medium to bold 41*s*. 6*d*. to 46*s*. 6*d*., peaberry 40*s*. Nyasaland.—65 bags sold, chips and pickings 26*s*. to 31*s*.

Jamaica—Of 120 barrels 161 bags offered, 37 barrels 103 bags sold, good to fine ordinary greenish 34*s*. to 45s., low middling to middling greenish 49*s*. to 58*s*., good middling blue 63*s*. to 65*s*,, fine bold blue 82*s*. peaberry 53*s*.

Costa Rica.—4,283 bags catalogued practically all sold, smalls 40*s*. to 58*s*. 6*d*., low middling to middling 56*s*. 6*d*., to 66*s*., good to fine middling blue 67*s*. to 81*s*. 6*d*., fair to good bold 73*s*. to 81*s*. 6*d*., fine blue bold 83*s*. to 91*s*. 6*d*., peaberry 50*s*. to 96*s*.

Guatemala—1,036 bags mostly sold, smalls 36*s*. to 46*s*., fine ordinary to low middling 44*s*. to 51*s*., middling 52*s*. 6*d*. to 55*s*., bold 61*s*. 6*d*., to 68*s*, peaberry 48*s*. to 65*s*. 6*d*.

Salvador—Of 1,399 bags offered 1,200 bags sold, smalls 42*s*. to 46*s*. 6*d*., low middling to middling 46*s*. to 53*s*. 6*d*., good middling blue 55*s*. 6*d*., to 58*s*. 6*d*., bold 63*s*. to 72*s*., peaberry 50*s*. to 71*s*.

Nicaragua—Of 1,219 bags catalogued 750 bags sold, smalls 36*s*. 6*d*. to 45*s*. 6*d*., low middling to middling 49*s*. to 52*s*. 6*d*., bold 57*s*. to 60*s*., peaberry 55*s*. to 62*s*.

Mexican—Of 554 bags offered 320 bags sold, smalls 41*s*. to 44*s*., middling 52*s*. 6*d*. to 55*s*., good to fine bold 65*s*. 6*d*. to 77*s*,, peaberry 51*s*. to 71,

Colombian—722 bags partly damaged sold, smalls 35*s*. to 45*s*. 6*d*., ordinary to good ordinary 31*s*. 6*d*. to 35*s*. 6*d*., low middling to middling greenish 43*s*. 6*d*. to 54*s*. 6*d*., good middling blue 56*s*., bold 66*s*. 6*d*. to 67*s*. 6*d*., peaberry 48*s*. 6*d*. to 61*s*. 6*d*.

Ecuador—324 bags sold, ordinary greenish 29*s*. to 29*s*. 6*d*.

Brazil—Of 625 bags unwashed Dumont Santos, quay terms, 390 bags sold, smalls 27*s*. medium to bold 31*s*. to 33*s*., peaberry 32*s*. 6*d*. to 33*s*, 17 bags washed Rio bought in,

Planting opinion 10th May, 1902.

Singapore.

Abstract of Meteorological Readings for April, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·867	150·0	79·9	87·0	73·1	13·9	77·8	·891	76·4	82	S.E. and calm.	8·87	1·57

K. K. Hospital Observatory,
Singapore, 15th May, 1902

A. B. LEICESTER,
Meteorological Observer.

T. S. KERR,
Principal Civil Medical Officer, S.S.

Penang.

Abstract of Meteorological Readings for April, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%	miles.	ins.	ins.
Criminal Prison Observatory	29·898	152·4	81·4	90·3	74·7	15·6	77·4	·861	73·3	74	S.	10·62	1·84

G. D. FREER,

Acting Colonial Surgeon, Penang

Penang, 7th May, 1902.

Malacca.

Abstract of Meteorological Readings for April, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Greatest Rainfall during 24 hours.	Total Rainfall.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%		ins.	ins.
General Hospital.	29·831	153·5	82·8	89·7	69·4	20·3	81·4	1·057	59·6	93	E.	13·24	3·90

Malacca, 5th May, 1902.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean wet.	Hygrometer. Vapour Tension.	Hygrometer. Humidity.	Total Rainfall.	Greatest Rainfall in 24 hours.
Taiping ...	158	81·93	92	72	20	78·07	·912	84	27·42	4·17
Kuala Kangsar ...	...	81·03	92	72	20	76·88	·870	83	18·12	2·43
Batu Gajah ...	166	81·22	92	71	21	77·36	·890	84	16·40	2·02
Gopeng ...	...	80·76	92	67	25	77·27	·891	85	19·39	4·35
Ipoh ...	...	81·14	92	71	21	77·39	·891	84	13·08	1·90
Kampar ...	...	...	91	70	21	...	...	...	19·51	3·20
Teluk Anson ...	...	81·51	91	72	19	77·65	·896	84	8·05	1·75
Tapah ...	..	80·83	93	70	23	77·25	·888	85	18·09	2·93
Parit Buntar ...	...	82·45	92	73	19	78·29	·913	83	9·80	2·30
Bagan Serai ...	...	81·69	91	72	19	77·61	·892	83	7·24	1·58
Selama ...	...	82·29	92	72	20	77·88	·891	81	21·25	2·82

STATE SURGEON'S OFFICE,
Taiping, 10th May, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·877	151·1	81·9	91·1	72·2	18·9	76·7	0·831	73·5	76	Calm	11·36	2,31
Pudoh Gaol Hospital ,,	...	...	...	...	...	..	...	...	...	...	...	16·03	2,51
District Hospital ,,	...	...	...	...	...	...	...	...	...	...	...	13·71	2,00
,, Klang	...	...	...	86·5	75·0	11·5	...	...	...	...	...	10·68	2,03
,, Kuala Langat	...	...	...	86·8	73·0	13·8	...	...	...	...	...	3·60	1,20
,, Kajang	...	...	...	86·2	76·0	10.2	...	...	...	...	...	11·04	2,25
,, Kuala Selangor	...	...	...	86·0	76·8	9·2	...	...	...	...	...	9·35	2.70
,, Kuala Kubu	...	...	...	92 9	73·5	19·4	...	...	...	...	...	15·43	3.31
,, Serendah	...	...	...	88·1	74·6	13·5	...	...	...	...	...	12·23	2,19
,, Rawang	...	...	...	86·6	74·4	12.2	...	...	...	...	...	22·61	4,81
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	11·25	2,68

STATE SURGEON'S OFFICE,
Kuala Lumpur, 13th May, 1902.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for April, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, District H'pital	...	...	...	92·	73·	81·8	...	...	...	...	...	13·16	3·55
Kuala Lipis - - -	...	...	84·	97·	71·	26·	...	...	...	...	...	10·99	3·05
Raub - - -	...	...	82·6	96·	71·	25·	...	...	...	...	...	13·49	2·12
Bentong - - -	...	...	79·4	92.	68·	24·	...	...	...	...	...	11·49	2·00
Kuantan - - -	...	...	...	85·	73·	12·	...	...	...	...	...	14·36	4·30
Temerloh - - -	...	...	...	93·	70·	23·	...	...	...	...	...	4·56	·96

RESIDENCY SURGEON'S OFFICE,
Kuala Lipis, 1st May, 1902.

P. N. GERRARD, M. D.,
Acting Residency Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for April, 1902.

District.	Mean Barometical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	83	93	73	20	74·5	...	...	...	E.	10.02	3·35

Muar, 2nd May, 1902.

FRANCIS PEARS.

Singapore.

Abstract of Meteorological Readings for May, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall,	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum,	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·884	142·0	80·6	87·9	73·9	14·0	79·7	·896	79·8	79	S. E.	3·63	·86

K. K. Hospital Observatory,
Singapore, 19th June, 1902

A. B. LEICESTER,
Meteorological Observer.

T. S. KERR,
Principal Civil Medical Officer, S.S

Penang.

Abstract of Meteorological Readings for May, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	°F	°F	%	miles.	ins.	ins.
Criminal Prison Observatory	29·886	149·8	81·2	90·6	74·8	15·8	76·9	·842	71·6	73	S.	5·42	1·73

G. D. FREER,

Acting Colonial Surgeon, Penang

Penang, 9th June, 1902.

Malacca.

Abstract of Meteorological Readings for May, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Greatest Rainfall during 24 hours.	Total Rainfall.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital.	ins. 29·845	°F 151·8	°F 82·7	°F 88·9	°F 69·6	°F 19·3	°F 81·3	°F 1·055	°F 60	% 93	S. W.	ins. 8·01	ins. 2·37

Malacca, 10th June, 1902.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for May, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet.	Vapour Tension.	Humidity.		
Taiping ...	155	88·48	95	72	23	78·56	·910	79	9·86	1·89
Kuala Kangsar ...	...	81·83	93	72	21	77·42	·881	81	7·57	2·57
Batu Gajah ...	161	82·03	93	72	21	77·55	·884	81	6·39	1·12
Gopeng ...	...	81·70	92	66	26	77·72	·896	83	10·98	2·53
Ipoh ...	...	81·79	93	71	22	77·71	·895	83	13·98	2·40
Kampar ...	...	...	92	69	23	...	...	...	15·99	2·64
Teluk Anson ...	...	82·22	92	72	20	77·86	·896	82	8·43	3·35
Tapah ...	..	81·42	92	69	23	77·57	·894	84	14·58	2·56
Parit Buntar ...	...	83·36	94	72	22	78·92	·930	81	2·14	·87
Bagan Serai ...	...	82·89	92	72	20	78·27	·904	80	3·99	1·43
Selama ...	...	82·39	91	73	18	78·04	·902	82	8·74	1·85

STATE SURGEON'S OFFICE,
Taiping, 14th June, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for May, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·868	151·1	81·9	91·0	72·4	18·6	77·1	0·837	73·9	77	Calm	11·28	1.84
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	12·13	2.25
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	9·99	1.85
,, Klang	...	...	...	86·1	75·0	11·1	...	...	...	...	...	5·72	1.51
,, Kuala Langat	...	...	...	85·6	72·5	13·1	...	...	...	...	...	7·05	3.10
,, Kajang	...	...	...	86·6	76·5	10.1	...	...	...	...	...	8·14	2.45
,, Kuala Selangor	...	...	...	85·6	76·7	8·9	...	...	...	...	...	6·35	2.02
,, Kuala Kubu	...	...	...	93·2	73·9	19·3	...	...	...	...	...	13·49	1.85
,, Serendah	...	...	...	87·9	75·3	12·6	...	...	...	...	...	15·07	3.45
,, Rawang	...	...	...	86·7	75·1	11.6	...	...	...	...	...	10·70	2.65
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	6·80	3.33

State Surgeon's Office,
Kuala Lumpur, 11th June, 1902.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for May, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, District H'pital	...	...	...	93°	73°	18·8	...	...	...	...	...	6·16	1.21
Kuala Lipis - -	...	...	...	...	...	...	...	...	...	...	...	...	...
Raub - - -	...	...	...	...	...	...	...	...	...	...	...	...	...
Bentong - - -	...	...	...	...	...	...	...	...	...	...	...	...	...
Kuantan - - -	...	...	...	85°	73°	12°	...	...	...	...	...	7·04	1·95
Temerloh - - -	...	...	...	92°	71°	21°	...	...	...	...	...	8·41	1·46

RESIDENCY SURGEON'S OFFICE,
Kuala Lipis, 31st May, 1902.

D. H. McCLOSKY,
District Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for May, 1902.

District.	Mean Barometical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	85·6	95·	80·	15·	76·	...	...	...	S. W.	8·85	3·25

Muar, 14th June, 1902.

FRANCIS PEARS.

No. 10.] AUGUST, 1902. [VOL. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

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FRUITS OF THE MALAY PENINSULA, Wild or Cultivated.

BY H. N. RIDLEY.

In this paper I propose to give notes on the fruits of the Malay Peninsula, both those introduced from other regions and the wild ones or native kinds, that may be or have been considered eatable. Many of the wild fruits which are mentioned in books of travel and the like are really very poor and only fit for natives, but still I consider these worth recording partly as a matter of general interest and partly because questions are often asked as to the value of such fruits. Many exotic fruits again which have been introduced into the Straits Settlements and often highly recommended in books are certainly either tasteless or poor here, though under other circumstances they may possibly be more valuable.

I have arranged the fruits according to natural orders, as I found it difficult to class them satisfactorily in any other way. This arrangement has at least the advantage of keeping many closely similar fruits together.

ANONACEÆ.

To this order belongs one genus of really good fruits, that is *Anona*, the custard apples. All are natives of South America, small trees or little more than shrubs, with shining leaves and dull greenish flowers. They are raised from seed and of fairly rapid growth.

The custard apple, or sweet-sop, *Anona squamosa,* Nona Kapri is a large shrub, easily raised from seed. It will grow in almost any soil, unless too damp, but does best in fairly rich soil, in open ground. It has been known to fruit in a year and-a-half from planting. Fruit is produced rather irregularly throughout the year, but has a tendency to be most abundant in June and July.

It is green and covered with short warty processes and fair sized fruits, are about three inches through. When ripe it turns blackish, and becomes quite soft. The creamy pulp surrounding the numerous black seeds is not very abundant, but is very delicately flavoured. It is used in puddings and ices in India and a drink like cider is made from it in the West Indies.

The tree is liable to attacks of the caterpillar of the large Atlas moth, *Attacus Atlas* and also to those of a species of *Parasa,* one of the nettle grubs, a pale bluish white caterpillar armed with short poisonous stinging thorns. Hand picking is the only method of getting rid of these pests.

The sour-sop, *Anona muricata,* Durian Blanda is a rather larger shrub or small tree. The fruit attains a large size about 2 lbs. weight dark green and obversely pear shaped, covered with short soft processes. The pulp is more abundant than in the Sweet-sop fibrous and very juicy, with a pleasant acid taste. It can be eaten fresh, but is probably best known in the form of sour-sop ice, the juice being squeezed out to form the flavouring of the cream. It also makes an excellent pudding with whipped cream or may be used for flavouring blanc-mange or corn-flour.

The bullock's heart, *Anona reticulata,* Bua S'ri Kaya, is perhaps the best of the Anonas grown here. The tree resembles those of the other species, but the fruit is much larger than the sweet-sop though smaller than the sour-sop. Its surface is smoother than either and when ripe is reddish in colour. The flesh is white and rather firmer than that of the sweet-sop, and much more abundant, with a very delicate flavour. The tree does not do well in Singapore for some reason, but thrives well in Malacca where very excellent fruit can be obtained. It is not as often cultivated as either of the other two, but is really the best eating fruit of the order.

The Cherimoyer, *Anona cherimolia,* is often asked for by gardeners here. It has the reputation of being far the finest of all Anonas. The tree has been in cultivation here several times, but it thrives but ill and has never been known to fruit. I hear also that in Java it has proved always a failure.

Uvaria Ridleyi., King.

A small shrub growing in sandy places in Pahang, and known to the natives as "Ladak," produces a small fruit with a sweet pulp which is very pleasant. It is too small to be worth cultivating.

NYMPHEACEÆ.

The seeds of the lotus, *Nelumbium Lotus,* the well known cultivated plant are eaten as nuts by the Chinese and other natives and are well worth eating. When ripe, they are peeled and eaten raw.

BIXINEÆ.

This order contains several trees belonging to the genus *Flacourtia,* which produce abundance of small but pleasant fruit, of these the best is *Flacourtia cataphracta,* the Rukam. The tree attains a height of about 20 feet with a spreading head. The stem is armed with powerful branched thorns, the leaves small lanceolate acute toothed 3 inches long. The flowers are small and yellowish green. The fruit is globular about half an inch long, with stigmas on the top, of a dull reddish colour, containing a number of rather large flat seeds. The fruit has somewhat of the flavour of a gooseberry but it is peculiar in one respect, that even when quite ripe it is hard

and astringent and quite uneatable unless rolled about and pressed by the fingers when it becomes quite soft and the astringent taste disappears entirely. The tree is very common in villages and waste places, the seeds being often dispersed by birds. It will grow in almost any soil sufficiently dry, and grows fairly fast, fruiting in four or five years. It prefers full sun or at the most light shade. The tree is always raised from seed. The seeds are said to yield an oil which might be of value. It flowers in January to March.

Fl. Rukam.—Is a very similar tree with larger and broader leaves, as much as 6 inches long and three wide more often occurring in woods and shaded places. It fruits rather earlier than *Fl. cataphracta*, but as a rule not so heavily. The fruit is generally considered inferior. It flowers October to January, but often at other times, fruits February to July.

Fl. inermis, Roxb.—Is a small tree with very much of the habit of the other two but with the fruit is very different being of a bright cherry red and very acid, excellent when cooked for pies, etc.

POLYGALEÆ.

The only eatable fruit of this order is that of *Xanthophyllum obscurum*, a large often huge tree with deep shining green leaves and white flowers. The fruit is as large as a cricket ball or larger, with a thick rind enclosing several seeds wrapped in a sweet white pulp, which however, is rather scanty. It is eaten by natives and though somewhat refreshing when met with in the woods, is not worth cultivating for its fruit as there is so little flesh on the seed. It occurs widely all over the Peninsula and is known to the Malays as Buah Kapas and also Lemak Berok, the latter name however, is applied to other and uneatable species of the genus.

GUTTIFERÆ.

The best known fruit of this order is probably the best known fruit of the East, *viz.*, the Mangosteen, *Garcinia mangostana*. A tree usually small about 12 to 15 feet tall, with a large head of deep green leathery leaves. I have, however, seen trees of a quite different form being about 40 feet tall and much more drawn up. Such trees, however, are not to be recommended. The tree is raised from seed and is of fairly rapid growth.

Mangosteen trees are not often pruned or subjected to any attempts at improvement in cultivation. Pruning is, however, beneficial especially when the trees have got old and are ceasing to bear. In any case suckers growing erect through the tree should be removed and proper pruning might be very beneficial to almost all trees.

The Mangosteen flowers in March and May or earlier, and in Singapore fruits can be obtained from May to December, the heaviest crop being produced from about August to September. Different trees fruit at different times according to their ages. A few as early in the year as January. The soil should be good if possible, but the tree seems to thrive in almost any place provided it is not excessively wet. It is far less particular in this than the

Durian. Low lying rich alluvial flats seem to suit it well, especially if they are drained of excess of water. Trees should fruit in about 9 or 10 years after planting, but some commence earlier. It is seldom attacked badly by any pest. Mistletoes (*Loranthus*) very rarely damage it, the little fern *Drymoglossum* is not uncommon on it, and should be removed whenever too abundant. The old leaves are often covered with the parasitic leaf lichens but this does not seem to hurt the tree to any extent.

Of insect pests, there is a caterpillar which attacks the young leaves when just put out while they are soft and yellow. It is smooth and rather slender an inch and-a-half long. The head is of a pale ochre yellow, the next segments purple, rather lighter in colour in the middle, the back grey with a broad purple line, edged with white down the centre, the sides are dark purple with a white wavy line and a lower black one along the spiracles, the belly and legs are pale green. There is a reddish fawn coloured patch on the last joint but one of the body and the last segments are deep purple, the hind legs ochre coloured. I failed to rear the moth and as the caterpillar is seldom to be found though the damage is conspicuous I imagine it feeds by night chiefly. The insect is probably one of the Nocturidœ. I met with it in January.

The amount of damage done by this caterpillar is not so far as I have seen very great but it certainly spoils the appearance of the tree, and checks its growth. It never seems to touch the stiff leathery dark green adult leaves. It also attacks *Garcinia dulcis*.

There is also a leaf mining caterpillar which burrows in the young and adult leaf and does a certain amount of harm, causing dead patches in the leaf, which also often curls up and becomes deformed.

The fruit is not often attacked by animals. It is too large and with too tough a rind for the small fruit bats. Monkeys are of course very troublesome where the trees are near forests, Musangs do not seem to attack them often. A good deal of fruit is sometimes destroyed by wind. As it bruises very easily, a heavy gale of wind will sometimes so beat the fruits against each other and against the boughs that the whole crop is destroyed. So that in very windy spots it is advisable to plant the trees so that they are protected from storms, which as they are not usually tall trees is very easy to arrange.

The fruit varies a good deal in size, some being small with very little pulp, others have a rind very thick in proportion to the amount of pulp. A good deal of this variation is, I think, caused by the amount of fertilization, but also is due to the weather during the fruiting season, as the fruit sets a good many of the young fruits fall off and are wasted.

The young fruits are used by the Malays to make a kind of preserve known as Halua Mangis. The rind is taken off and the inside boiled with sugar. The rind of the fruit is used in native medicine and is largely exported to China.

A native species of *Garcinia*, much resembling in appearance the Mangosteen, is not uncommon especially in sandy open coun-

try near the sea. It is *Garcinia Hombroniana,* and is readily distinguished by its smaller cream coloured flowers and red fruit. The rind of which is very much thinner than that of the Mangosteen and has the scent of apples. The pulp of the seeds is more scanty than that of the Mangosteen and somewhat acid, but has a very delicate flavour of peaches, on the whole it has the making of a very superior fruit, or would very much improve the common Mangosteen if it could be crossed with it. Unfortunately, it does not, as a rule, flower at the same time, so that it has not been possible to effect the cross.

Another distinct set of Garcinias is the group which has a soft usually yellow or orange acid outer rind, and much smaller stigmas, several of these are eatable. One of them is *Garcinia nigrolineata,* Planch, the Kandis a common tall and slender jungle tree about 60 feet high, with generally at least unisexual flowers, small bright yellow and small oval fruit about an inch and a half long, orange colour. The pulp of the seeds is very sweet and pleasant and although the fruit is small, it is worth eating, though hardly worth cultivating. The tree occurs in woods over a good part of the Peninsula and when it fruits generally does so abundantly. On one occasion having collected a good quantity I had them stewed, but the result was not very satisfactory, the rind became rather tough and its acid somewhat spoiled the sweet pulp.

There are several others of this group of Garcinias which are known as Kandis. Among them Kandis Gajah, *Garcinia Griffithii,* is a fairly tall tree with very large leaves, and large round fruit flattened at the top, and of a russet colour, much resembling an apple at first sight. The fruit is very acid, but is sometimes cooked by Malays.

By far the best of these is however the Asam Gelugur (*G. atroviridis,*) a very handsome tree with deep green leaves, the young shoots bright pink, large crimson flowers, and a large round fruit flattened at both ends and grooved from top to bottom regularly all round. It is of a beautiful orange yellow colour. The outer rind is firm textured but not at all tough and inside are the seeds covered with a rather thin translucent pulp. This rind is too acid, to eat raw, but when stewed with plenty of sugar it makes a most excellent dish. The Malays cut or break it up into its segments, dry it in the sun and eat it with curry. The tree which is a native of the Peninsula is not exceedingly common, but fairly abundant in some places and might be cultivated more abundantly. It would probably make an excellent jam.

The Mundu, *Garcinia dulcis,* is a native of the Malay Islands. It is a tree with rather large dark green leaves, and a yellow egg-shaped fruit, not very common in the Straits but occurring here and there in villages. The fruit is eaten to a small extent by natives, and I have had some very good jam made from it in Singapore which much resembled greengage jam but with a very distinct flavour.

Garcinia costata, Hemsley, collected on Gunong Bubu by WRAY is said to have also deeply grooved eatable fruit.

G. Prainiana.—The Chekow or Cherapu or Chupu is a rather

tall tree with eatable but acid fruit. I have met with it in Perak where the natives were collecting the fruit to eat.

Mammea americana.—The Mammee apple of the West Indies has long been cultivated in the Botanic Gardens Singapore, but has never yet shown signs of flowering.

TERNSTRÆMIACEÆ.

The butter-nut, *Caryocar nuciferum,* native of South America has not long been introduced successfully into Singapore. It seems to do well, but it will probably prove of very slow growth.

MALVACEÆ.

Hibiscus Sabdariffa, the Rosella is a tall herbaceous mallow with large yellow flowers with a purple centre. It is an annual and raised from seed. The fleshy calyx and capsule are acid and of a pleasant taste, and are used for preserves. It is not often cultivated here but grows very well, and is worth the attention of gardeners. It is popular in India and the West Indies.

The Durian, *Durio zibethinus,* L. is perhaps the most famous fruit of the Malay region, and it is unnecesary to describe it. The tree varies a good deal in height, and this seems chiefly to depend on the soil in which it is grown. In stiff clay especially on hill slopes, it never seems to thrive, but on low flat alluvial soil it often attains an enormous height, over 100 feet. In bad soils it not only is stunted and short-lived, but it often though flowering regularly and heavily never sets a single fruit. The tree is always raised from seed and takes about ten or twelve years to produce fruit.

It flowers in April and May or later producing fruit in six months. The fruit varies a good deal in size and flavour. A very large kind weighing 10 or 15 pounds is known as Durian Kapala Gajah. A small seedless variety chiefly obtained from Buru is Durian Tembaga. I have met with a curious variety in which the fruit which was very large had a hole in the top and inside was another small durian complete with the spiny husk replacing the placenta of the fruit. A good Durian should have little of the strong odour for which it is famous, and have plenty of pulp on the seeds. The characteristic flavour of onions common in inferior fruit should be absent, and the pulp of a creamy and not stringy consistency. Green Durians with slender close spines on the husk are always poor in flavour. The fruit should be of a clean light brown with rather distant conic spines, and but little odour. It is ripe when the husk begins to split and does not keep at all well, requiring to be eaten as soon as it is quite ripe.

The Durian is supposed to be very strengthening especially for children, and also to have strong aphrodisiac qualities. It is indigestible, however, to some persons. The fruit is usually eaten fresh, but sometimes used in making ices. Durian cake, Lumpuh, is made when durians are very abundant, by boiling the pulp with sugar, and making it into rolls wrapped in Pandan leaves. It is more popular with natives than Europeans.

The seeds are boiled and cut up, then cooked with coco-nut oil

and sugared and eaten as a sweetmeat under the name of Keripi Durian, or they are pounded up to a flour and mixed with sugar to make cakes known as Dodol Durian.

Lahia Kutejensis.—A native of Borneo has lately been introduced into the Botanic Gardens. It is a tree very much resembling a Durian, the fruit of which is said to possess all the flavour of a good Durian without the odour.

TILIACEÆ.

The only fruits of this order that are at all eatable are those of *Grewia latifolia* and *fibrocarpa*, shrubs with yellow flowers and an orange coloured drupe about half an inch long of which the pulp which is very acid has a very pleasant flavour. They are not a very common plant. The fruits are used in curries by Malays as chutneys.

OXALIDEÆ.

Of this order we have two trees of some importance the Blimbing *Averrhoa Bilimbi*, and the Carambola, *A. carambola*.

The Blimbing is probably a native of India but does not appear to be known anywhere in a wild state. It is a small tree branching low down with pinnate leaves, leaflets oblong acute 3 inches and deep red flowers borne on the old wood of the branches and stems. The fruit is green and resembles a small cucumber or gherkin. It is generally used in curries, or can be stewed. It is pleasantly acid, containing oxalic acid, so that it has somewhat the flavour of rhubarb when cooked.

The Carambola, is a somewhat similar tree with pink flowers, and small rounder leaflets. The fruit is about 3 inches long strongly four angled and of a half translucent yellow colour. There are two forms of it one very acid, the other sweet enough to be eaten raw. It is however best stewed and makes a very excellent imitation of rhubarb tart. It can also be served with whipped cream.

Both of these trees are raised from seed and planted in suitable soil, low lying and dark coloured, grow fairly rapidly. They last and fruit regularly and fairly heavily for many years.

Both trees are worth cultivating in any garden but the carambola both from the larger size and better flavour of its fruit is the best of the two.

Connaropsis Griffithii.—The Pupoi is a tree about 60 feet tall with eatable fruits as large as a cherry. The fruits are made into preserves, or eaten with curry. It is not planted but occurs wild in Malacca. The smaller red fruits of *C. monophylla*, the Blimbing Pipit or Blimbing Kra, are also used by natives in curry.. The tree is smaller, and occurs wild in Malacca, Perak, etc.

MALPIGHIACEÆ.

These are mostly American trees and shrubs, and the only ones which produce eatable fruits are *Malpighia ureus* and *glabra*. *M. ureus*, the Barbados Cherry is a pretty small tree with small leaves and pink flowers, followed by a fruit which in appearance resembles a white-heart cherry, of a bright cherry red colour, with

plenty of flesh on the single stone. The flavour of the fruit is somewhat like that of a cherry with a trace of raspberry. It grows readily from seed, but here at least is not a heavy cropper. It fruits, however, nearly all the year round.

RUTACEÆ.

This order contains the oranges, limes and pumelos, belonging to the genus Citrus, the lime berry, *Triphasia*, L.

Citrus decumana, L. The Pumelo, Shaddock, Forbidden Fruit.—A big tree usually larger than most other species, easily known by its large fruits, and the usually broad triangular wing on the leafstalk, and large flowers. There are several varieties of this fruit. The commonest form is white fleshed. and this is, as a rule, the best flavoured. A pink fleshed one is also commonly cultivated which is often equally sweet and well flavoured. The Bali Pumelo is a smaller plant, fruiting when comparatively small tree. The fruit is globular and white fleshed. It is a very floriferous variety and is worth cultivating for its sweet scented flowers alone. The fruit however is excellent.

The Pumelo grows well all over the Peninsula, especially in good low lying soil, but its fruits are very liable to attacks of the pumelo moth. The rind of the pumelo is highly valued by natives for making candied peel, being dried cut up small and boiled in sugar.

Citrus limonum var acida. The Sour Lime.—Is cultivated in most parts of the Peninsula, but by no means as much as it should be considering the importance of the fruit to health in the tropics. It will grow almost anywhere and fruits very heavily. The fruit is globular or oblong about 2 inches through, smooth green or yellow when kept. It is used for making drinks, ices, etc. and practically plays here the part of the Lemon in Europe. It can be grown from cuttings or seed.

The common and best variety is the Limau Nipis of the Malays.

Other varieties are Limau Kasturi, a small plant, the leaves smaller and a little narrower, the fruit quite globular about an inch through, smooth and shining, turning yellow as it ripens. It is very acid and is used chiefly for pickling.

Limau Susu is a low straggling bush with large white flowers, about as big as those of a pumelo, a thorny stem and elliptic blunt leaves, three inches long with a short not winged petiole. The fruit is as large as a lemon, oblong or globular oblong beaked, the rind tolerably thick. It is chiefly used for washing clothes but can also be pickled.

There are also forms of this with very large long fruits as big as a pumelo as well as quite round ones. It is possible that this is a cultivated form of the pumelo, but its habit is totally different.

The Lemon has been successfully grown in the Gardens of Malacca, Penang and Singapore up to an altitude of 1,500 feet. The trees all fruited, and produced excellent lemons, but they were attacked by the pumelo moth in many cases and spoiled. The tree is not however so hardy as the lime, and seems to be more particu-

lar as to its soil. I have seen however excellent Lemons grown in Singapore by Mr. GUNN.

Citron, *Citrus medica*.—The citron has been cultivated here, and some forms are well known to natives. The Katinga of Southern Siam, described in Bulletin 3 p. 96, is probably a wild form, and there are some curious thick skinned wild oranges in the Peninsula which are also probably wild forms. The fruit of the citron proper is of large size oblong and irregularly warted or wrinkled, the rind very thick and the pulp scanty and dry. The rind is the part used in confectionery, as candied peel. The Katinga had lanceolate thin leaves with a very short petiole. The fruit was about 4 inches long and 3 inches through oblong and rounded at both ends greenish coloured eventually turning yellow, dotted and warty. The rind is half an inch thick lemon yellow inside full of oblong parallel turpentine cells narrowed at the mouth and enlarged below, tough and with a turpentiney taste rather bitter.

There are five partitions in the fruit rather thick and tough. The seeds numerous about 5 in a section ovate flattened ½ an inch long ⅛ inch thick olive grey. The pulp is a sticky tasteless mass of flattened fibres olive green.

This is perhaps the original wild form of the citron, which Loureiro gives the name of Cay tanh yen as Cochin Chinese which might easily be modified into Katinga.

Citrus hystrix,—Limau Puru, is a small tree with dark green leaves 3 inches long the blade 1½ inch long and an inch wide rounded and very slightly notched round the edge, the petiole wing is nearly as large or even larger than the blade so that the leaf looks as if it was made of two one on the end of the other. The fruit is about 2 inches long green pearshaped and curiously wrinkled all over. The rind is about ⅛ inch thick. The pulp is slightly bitter and very acid. It is chiefly used for cleaning the hair but also in medicine. The rind is scraped to use in flavouring cakes.

This plant is probably a cultivated form of the citron. I obtained a plant with very similar fruit in Pahang some years ago under the name of Limau Kedangsa the only difference being the wing of the petiole of the leaf which was quite narrow the development of this wing however is not at all characteristic as trees differ very much in this matter. The fruit is figured in Bonavia's oranges and Lemons of India and Ceylon Plate CCXXV under the name of the Leech Lime or Caffre lime. He considers it to be the *Citrus hystrix* of Kurz, and probably originally wild in the Moluccas.

The Orange, *Citrus Aurantium*, is often cultivated especially in Malacca. In Singapore the soil is hardly sufficiently good, and the trees are often unhealthy, producing small and sour fruits and being much affected by blight. It is probable that the excessive wet of our climate is injurious to the orange trees, as in the dryer portions of the Peninsula such as Malacca they are much better. I have seen very good oranges there, as well as Tangerine oranges. It is perhaps unnecessary to mention that our oranges like all tropical ones are quite green when ripe and do not develop the yellow colour of the imported Chinese or European oranges. Some

orange trees produce fine large fruit with acid pulp, too acid to be eaten, these however make an excellent drink and are a pleasant variation from Lime squashes.

The Orange here requires fairly good soil at least, and should be manured with burnt earth.

All species of citrus are very liable to scale which is easily detected at a glance by the blackening of the leaves due to a fungus which grows on the excreta of the scale insect. In India and elsewhere Kerosine emulsion has been found efficacious against the red orange scale *Aspidiotus Ficus*, and would probably suit all other kinds. Scale constantly attacks plants in poor condition, and is often a sign of poverty of soil, so that in cases of bad attacks the importance of manuring the trees is at once indicated.

The caterpillar of the butterfly, *Papilio Erithonius*, is destructive to the foliage especially of young orange trees. It is described in Agricultural Bulletin Ser. I. p. 259. It is smooth and bluish green with black markings and when touched puts out two long red tentacles so that it is easily recognized. It must be destroyed by hand picking.

The pumelo moth *Nephopteryx sagittiferella* is probably the worst and most destructive insect we have for the Citrus fruits. It chiefly attacks the Pumelo and Lemon. I have also seen it in the smaller limes. Its life history is described by Mr. WRAY in the Journal of the Royal Asiatic Society, Straits Branch, No. 19, p. 83. He says that the moth lays its eggs singly on the lower side of the fruit, and the young caterpillars eat their way into the fruits making a number of minute holes generally over an area the size of a shilling. As the caterpillars grow they eat their way through and through the fruit and make holes through the rind to eject refuse and admit air. They leave the fruit when full grown and descending to the earth, make holes lined with white silk where they pupate. In 12 days they hatch out into moths. The Caterpillars are bluish-green tinted with pinkish bronze above, the young ones almost wholly pink. Length of adult ·86 inch, ·15 inch wide. The moth is about an inch across warm brown colour shaded with silvery gray. It seems to fly chiefly at night.

The borings of the caterpillar are found to contain fæcal matter, which quickly decomposes, and soon swarms with bacteria. It is probable that the premature ripening and falling of the fruit may be ascribed to the attack of the bacteria. Other insects attracted by the decay, assist in destroying the fruit. The fruit falls prematurely and is useless. All infected fruit on the tree easily recognized by the holes and exudation of gum and fæcal matter should be destroyed, and all fallen fruit should also be burnt. Mr. WRAY also suggests that young uninfected fruit should be put in bags, to prevent the moth from attacking it and laying its eggs there.

The green leaf-beetle, *Astycus chrysochloris*, was described by Mr. WRAY (Perak Museum Notes II part I) as attacking the leaves of oranges and pumelos, as well as numerous other trees. The grubs live in the ground at a depth of not more than 6 inches, and

pupate there in little chambers in the earth They appear to eat decayed fragments of roots, leaves etc. The beetle is half an-inch long black covered with green scales. (Bulletin Ser I p. 252). Hand picking or shaking into cloths and then destroying is the best way of dealing with this pest.

Triphasia trifoliata.— The Lime-berry Limau Keah, is a shrub which produces small oranges as big as a large pea, orange colour with a taste of Marmalade. The plant is probably a native of China, but has long been cultivated all over the world. The fruits are usually made into preserves with syrup and as such are very palatable. They can also be used for making orange brandy. The fruit being put into the brandy and left to stand for a year or two in the same way as sloe-gin is made. The shrub is grown from seed and grows very readily. It is often grown as a hedge plant, for which it is well suited.

BURSERACEÆ.

An order of trees of which the only one of which the fruit is eaten is *Canarium,* the Kenari nut. The Canariums of which there are a considerable number, possess fruits with a thin hard flesh often of a turpentiney flavour covering an exceedingly hard seed usually triangular about 1½ inch long and sharply pointed at each end. The best part of this fruit is the kernal of the stone which tastes like a nut but it is very small and the stone is so hard that it requires a hammer to break it, *Canarium commune,* of Java is perhaps the best.

The Chinese pickle a smaller species whole in salt and water and preserve them in small jars which are sold in most of the good shops.

An unidentified species called Drija by the Malays was met with at Kota Glanggi, where the Sakais had been collecting large quantities of the fallen fruits for the sake of the kernals.

SOME OBSERVATIONS ON COLLECTING LATEX BY M. H. LECOMTE.

(Translated from the Journal D'Agriculture Tropicale 10, p. 100)

The fine demonstrations here given were made by M. LECOMTE at Paris under the auspices of the Association Francaise pour l'Avancement des Sciences.

The latex of rubber plants is enclosed in the laticiferous canals of which the branching varies with the nature of the plant and perhaps also with the biological conditions of the surroundings, and it is therefore clear that an exact knowledge of the branching of the laticiferous vessels is indispensable in order to fix regulations for a methodical plan of extraction.

Unfortunately this study is always neglected so that the processes of obtaining the latex are purely empirical, and my intention is not to consider all possible cases but only to call attention to a

certain number of facts and observations which may direct experimenters in their researches.

In the case for example of *Landolphia Heudelotii* Dec. which supplies the greater part of the caoutchouc exported from Senegal, the Soudan and of Guinea it is easy to see in a transverse section of the vine that the laticiferous vessels are chiefly found in the inner half of the bark but that they are nearly completely absent from the centre part of the bark as well as in the zone nearest the wood. To get at these vessels therefore it is not necessary to penetrate as far as the wood. The vessels in *Landolphia Heudelotii* Dec. are elongate tubes branched and anastomosing with a diameter varying from 30 to 40 thousandths of a millimeter. They extend chiefly in the direction of the length of the stem but as I have just said, branch and these branches run more or less obliquely.

A transverse section therefore of the bark of a given length and depth will cut across a certain number of the vessels from which the latex will escape while a longitudinal section of equal length and depth will only cut through a much smaller number (a figure to shew this is given in the text which we are unable to reproduce but the description is intelligible without this. Ed.) It is however easy to show this at least in *Landolphia Heudelotii* in the following manner. One knows, (and this is what the extraction of rubber from the dry bark is based on) that in this vine the latex dries of itself in the laticiferous vessels of the bark so that each vessel contains a very thin strand of rubber. If then one breaks transversely a piece of dry bark and carefully separates the fragments, one sees them joined by the thin filaments of rubber representing the number of vessels in the section. If the bark is broken longitudinally (*i e.* parallel to the direction of the stem) the number of threads of rubber drawn out is very much less, showing that the number of vessels cut across by a transverse section is far greater than those cut across by a longitudinal section. I have besides verified the fact in a young Castilloa, and Willes (Morris Cantor Lecture published by the Society of Arts April 1899,) has shown that in Heveas cultivated in the gardens at Heneratgoda, Ceylon, other things being equal incisions made obliquely at an angle of 45 degrees produce twice as much latex as vertical ones.

Transverse sections offer another advantage in the matter of collecting the latex. On account of the constant growth of the woody cylinder surrounded by bark, the bark not following this growth is stretched more and more, like a too tight coat round a stout body. It is this tension of the bark which produces the longitudinal cracks so characteristic of the oak of our country for example. If one takes off a transverse band of bark from the trunk of a tree and tries afterwards to put it back in the same place it was taken from it will be found that the ends will no longer meet.

It is just this tension which causes the escape of the latex which without this, capillarity would keep in the laticiferous vessels. Now in making a transverse cut one does not reduce the tension

of the tissues above and below the section any more than one prevents from pressing the body by doubling its width so that under these circumstances the latex should flow as strongly as possible.

A longitudinal section on the other hand gives a different result, for the lips of the wound will tend to separate and the tension will become weaker

As has been shown several causes combine to make the transverse cuts the most efficacious for allowing the escape of the latex. But are we to say that such cuts are entirely to be recommended? This is not our idea, for the collector has not only the actual present collection to look to, but the possibility of future collections. Now I do not say that from this point of view the transverse sections might not be disastrous and the more so the longer they are.

In fact the wound made in the bark heals more or less rapidly by the formation of fresh tissues and from this cause the laticiferous vessels at first continuous, are now separated in segments, which are the shorter the nearer the cuts are to each other. It follows that the later cuts only meeting with fragments of laticiferous vessels will only let out very little latex.

In my opinion for reasons stated above it will be most suitable if one makes transverse or oblique cuts in a vine or tree to make a certain number at the same height, say three metres from the ground and to recommence some time after a little lower and so on till the latest cuts are close to the ground. Leaving then the tree to recover for a sufficiently long period, at least a year, new tissues will form inside the bark and into these new tissues the original laticiferous vessels will penetrate. After this period, occupied by the tree in producing new tissues containing laticiferous tubes one can make the cuts again in the same way. In no case must complete circular incisions be made as these would arrest the circulation of the sap and seriously risk the life of the tree. Too wide cuts also must be avoided, for the healing of a wound is more difficult and long the further the edges are from each other.

It would not be difficult to arrange a programme of a certain number of experiments and observations to be made by persons dwelling in the tropics and having rubber plants at their disposal. The results of such investigations would be of much importance for the future of the plantations actually organized in various parts of the world. On this subject we shall deal again if possible later.

HENRI LECOMTE.

NOTE.—It is not correct to say as Bonysson does (Revue Generale des Sciences 1899, p. 831) that "the latex is a sort of ascending sap." I do not think that one can show as yet any proof that the latex circulates in the vessels. The fact that latex flows unequally from the two lips of a cut is due to the difference of tension of the tissues on both sides and the flow may be much greater from the upper lip of the cut than from the lower one. I have proved this in the case of *Landolphia florida*, Benth. in the Conservatories of the Museum.

The fact that incisions made near the ground in Hevea produce more latex than exactly similar ones made at a height of two or three metres can hardly be explained otherwise than by the tension of the tissues at different heights. H. L.

The importance of the action of tension in the tree as producing a flow of latex cannot be overlooked. In a normal state the tension varies at different times of the day, gradually diminishing from the morning to midday, and to the early part of the afternoon, when it is at its minimum. It then commences to increase continuing through the night and attaining its maximum at dawn. These variations correspond to the variations in transpiration of water. During the night the transpiration lessens so that the pressure of the water increases in the stem, during the day the transpiration increases to its maximum in the afternoon and with the lessening of the amount of water in the stem comes the lowering of the tension. Now we know that the flow of latex from the cuts in a Hevea increases just in those hours at which tension is greatest and transpiration least. The flow during the day is usually slight. It increases if the cuts are made towards evening and the greatest flow is obtained in the early morning.

Besides the regular diurnal variations in tension, there is also an annual periodicity at least in temperate climates. The tension increases in the spring till the summer. This increase being due to the thickening of the new wood and the drying and contracting of the outer layers of the bark. In our climate unfortunately little has been done to investigate the periodicity of growth of trees. The Heveas however in May just before they flower do shed all their leaves, and it is probable that at this time the tension is least; corresponding to the relaxation of tension in the winter season in colder climates. Experiments in this are much to be desired. In one or two cases owners of Hevea trees have reported that little or no latex flowed when the bark was cut, was it possible that in these cases the tension was not sufficient for some reason or other to force out the latex?

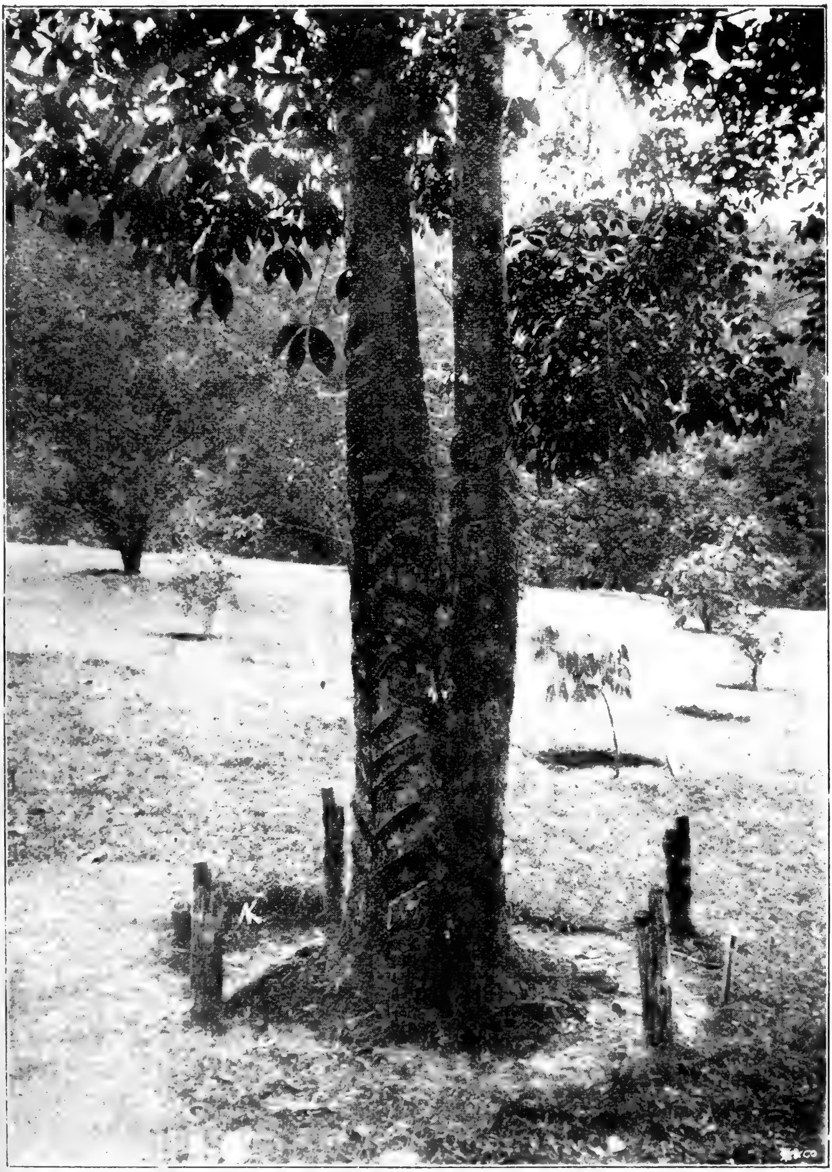
In tapping a tree in the Botanic Gardens, it was observed that the bark seemed loose, *i.e.*, not so firmly attached to the wood as is usual, this tree produced very little rubber, and though the tree was apparently healthy in other respects, it was probably sick. The looseness of the bark whatever the cause was, might be taken to show that the tension was at a minimum, and that alone would account for the feeble flow of latex.

H. N. R.

THE PENANG GARDENS RUBBER TREE.

PLATE V.

The Para rubber tree growing in the Waterfall Botanic Garden, Penang, to which reference has been made in successive Annual Reports on these Gardens since 1888, showing the result of six tappings, was one of about two dozen young plants received from the



Singapore Botanic Gardens towards the end of 1885 and planted out at the beginning of 1886. No particular attention was paid to these trees at the time more than to the many other economic and ornamental plants that were planted in this Garden that year then in course of foundation, and it so happened that two were planted side by side in poor gravelly soil on sloping ground which by the subsequent cutting of a new road alongside them some years later converted the site on which they are growing into what is virtually a dry bank. When, some ten years after these trees were planted, the question of the best method of extracting coagulating rubber, and the probable yield to be expected commenced to interest the planting community, this tree as being the largest in the garden, was selected for experiments which have been continued from time to time and the result recorded in the Annual Reports. There is nothing remarkable about this tree except that, as planters have often remarked, it is remarkably small for its age, but that is not surprising considering the nature of the soil and the situation in which it is growing. It is not pretended that the result of tapping one tree is of great value as a guide to the results to be obtained from a large number, for we now know from the experiments of Messrs. Derry, Arden, and others that there is a great dissimilarity in the yield of trees of equal size growing side by side and under exactly similar condition. The interest in this particular tree then is that it has been tapped successively six times from the eleventh to the fifteenth year of its age, that it shows no sign of deterioration, that the incisions made are all healed up, and that the total yield of dry rubber during that period is fifteen pounds ten ounces, obtained by the methods which have been fully described in the Annual Reports, and at the following seasons:—

Date of tapping.	Result in dry rubber.		Approximate age of tree at time of tapping.	Remarks.
	lbs.	oz.		
June 1897	1	0	11 Years	Circumference at the time tapping commenced 36 inches at three feet from the ground.
Nov.-Decr. 1898	3	0	12½ ,,	
April-May 1899	2	8	13 ,,	
Nov.-Decr. 1899	3	4	13½ ,,	
Oct.-Nov. 1900	3	12	14½ ,,	Circumference in December 1900, 66 inches. Height about 55 ft.
Aug.-Sept. 1901	2	2	15½ ,,	
Total...	15	10		

This tree has two stems, the fork commencing at three and a half feet trom the ground consequently the measurements recorded were taken at three feet from the ground, below the point of bifurcation. The largest of the two stems measures at five feet from the ground 44 inches, and the smaller one 34 inches. Since December, 1900, growth has been slow the present circumference of the main stem being only 68 inches; that is an increase of only two inches in a year and a half. It is probable that under existing circumstances this tree has almost attained its maximum size. One hundred such trees could be grown to the acre without being too crowded. Another tapping will be made in the course of a few weeks the result of which will be published in due course.

C. CURTIS,

Asst. Superintendent of Forests.

FICUS BRACTEATA.

I have received from Mr. BLAND, the Resident Councillor of Malacca, specimens of the leaves and fruits, of a large Fig tree, *Ficus bracteata,* together with a sample of rubber obtained from it. He imforms me that the Malay call it Getah Taban Rembah.

The plant is usually more of a large shrub than a tree with stout spreading branches, closely set with broad raised leafscars. The leaves are oblong cuspidate with a broad almost belobed base. They are about 7 inches long and 4 inches wide leathery dark smooth green above, and covered beneath especially on the nerves and mid rib with soft red fur. The nerves beneath about 8 pairs are very prominent.

The leaf-stalk is about an inch or 2 inches long, covered with red fur when young which soon rubs off. The figs are densely packed at the ends of the branches, with large lanceolate cuspidate bracts an inch and a-half long brown and especially at the bases covered with red fur. The figs also surrounded with red fur are globular, dark reddish brown with lighter spots, about half an inch long.

The rubber sent with the specimens is of a light flesh colour, compact hardly elastic, but soft. It becomes softer in hot water, but is not as putty-like as Jelutong rubber. In colour it certainly resembles Gutta percha sufficiently at least to be used as an adulterant, but alone it could hardly be mistaken for it.

Ficus bracteata, Wallich, occurs in Singapore, Malacca, Selangor or Perak and also in Java, I can find no record of any rubber having been obtained from it before.

H. N. R.

A COFFEE-BEAN PEST.

I received from Mr. A. BRUNNER, of Sumatra lately a sample of coffee bean seriously damaged by a small beetle, which burrowed

through the bean and escaped by a round hole usually at one end but sometimes through the side. This beetle is *Aræocerus fasciculatus*. It is about $\frac{1}{8}$ of an inch long brown, somewhat mottled and covered with fine short yellowish hair. Its head is bent downwards rather small, the antennae with a large basal joint followed by a slender portion of very small joints and ending in three broader obconic joints. The thorax is broad rounded and narrowed a little towards the head. The elytra oblong dotted finely in lines but covered with the yellow hair, so that the punctation does not show unless it is rubbed off. The elytra do not quite cover the abdomen which projects behind. The legs are short and stout. This beetle is very active on the wing and flies very briskly. A good account of this insect is to be found in the India Museum Notes IV. p. 125 plate XI. It has long been known to attack coffee beans, as well as ginger figs, betelnuts and all manner of other seeds, and has contrived to get carried all over the world probably in infected seeds of some kinds. The insect is in fact really a go-down pest. It does not attack coffee in the field, but haunts houses and stores where seed of different kinds are stored and must be attacked there. Seeds or coffee beans infected with this pest must be rigorously excluded from the store, or it will soon be infected, old refuse coffee, or other such stuff likely to contain the beetle should be destroyed by burning, or taken far away and buried. If the store has got infected, it should be thoroughly cleaned out, and whitewashed and all rubbish removed. If sufficient care be taken to avoid danger from explosion, the rooms infected by these and other warehouse pests can be disinfected by the use of Carbon bisulphide. An account of the use of this is published by W. E. HINDS as follows:

A large room belonging to a tobacco establishment was infected with the beetle, *Lasioderma serricorne,* a cigar beetle. About 145 pounds of Carbon bisulphide were exposed in fifty or more pans 3 feet long by 1 foot wide and 1 inch deep. The pans were distributed through the room as high up as could be conveniently placed. The building was carefully locked up and left for 22 hours and then opened for ventilation. Nearly all the beetles were destroyed. Special caution is necessary in preventing fire coming in contact with the gas, as it is exceedingly inflammable.

H. N. R.

IMPORTS OF COFFEE, COPRA AND KAPOK IN HOLLAND IN 1901.

The English Consul at Amsterdam (Consular report for 1901) states that the total importation of Coffee in Holland in 1901 amounted to 1,697,500 bags, a decrease of 134,104 bags on the previous year. Of this 1,200,000 bags came from Santos, 55,700 bags from Africa and 440,000 from the Dutch East Indies. Under the influence of two successive heavy crops in the Brazils the trade during the first half of the year dragged with falling prices only

towards the close of the year in October did the reports of a considerable decrease in the expected Brazil Crop cause some reaction in the market. The Java coffees ranged in value from $5\frac{3}{5}d.$ to $7\frac{1}{5}d.$ per lb, West Indian from 5 to $7\frac{1}{10}$, Santos from $3\frac{3}{20}$ to $4d.$ African $2\frac{7}{10}d$ to $3\frac{4}{5}d.$ per lb. Overproduction in Brazil had brought the prices for coffee down to a figure at which cultivation no longer paid and it would appear that nothing but a diminution in the Brazil production can give firmness to the market. The production in Java diminished in consequence of a bad crop nor is the present state of production in the Dutch East Indies progressive in consequence of the overpowering competition in Santos.

The dealings in "futures" especially for Santos showed a considerable increase. In Java there were next to no transactions of this nature for want of material.

COPRA.

Copra has greatly increased in importance in Holland markets not less than 40,740 tons being disposed of in Amsterdam in 1901. A great diminution in the crops was reported and as the consumption is steadily increasing there was much activity in the market at rising prices. Copra oil is a product which is in such demand that if the diminished supply of copra is not made up by larger crops and importation, prices may probably still advance. Quotations during 1901 ranged from 15*s.* per cwt. in January to 18.10 in December, through a steady advance while Copra oil rose from £2. 6. 7 to £2. 18. 5 per cwt.

KAPOK.

Total importation of Kapok was 48,000 bales nearly entirely for Amsterdam. Present quotations superior cleaned $7\frac{1}{5}d.$ to $7\frac{2}{5}d.$ per ℔. and good $5\frac{4}{5}d.$ to $7\frac{1}{5}d.$ per ℔.

Consular Report for 1901.

COFFEA STENOPHYLLA.

A sample of this Coffee cured and grown in Trinidad Botanic Gardens was forwarded to Messrs. Smithell & Co., 39 Mincing Lane, from the Imperial Department of Agriculture for the West Indies, for their report which was "The Coffee roasts evenly and the infusion is good better indeed than could be expected from the appearance of the raw bean. This variety of Coffee is not known on the London market but might readily become a marketable product. Owing to the present low price of Santos (Brazil Coffee) we could not value it in the present state of the market at above 38*s.* to 40*s.* per cwt. in Bond. Messrs. C. M. & C. Woodhouse of Mincing Lane also report as follows: We look favourably upon the sample and see no reason why the Coffee should not find a ready sale. To-day's value is about 42*s.* per cwt.

Agricultural News I, p. 7.

SUDU-SUDU.

This is the Malay name of *Euphorbea neriifolia*, Linn, a spiny succulent shrub with oblanceolate fleshy leaves. The leaves are used for making a sweetmeat. They contain a quantity of a poisonous milky latex, and it is very remarkable that such a plant should be used as a sweetmeat. The leaves are pricked all over and sprinkled with salt to get rid of the latex, and then sleeped in brine for three days, after which they are boiled in syrup.

The plant is probably a native of India, but is now cultivated all over the east, and propagated by cuttings. It attains a height of 15 or 20 feet when old, and is easily recognized by its quadrangular branches. RUMPH in the Herbarium Amboinense mentions it as being used in the Eastern islands in medicine, but not as a sweetmeat. The milky latex is generally used as a purgative in India and the Eastern islands.

H. N. R.

RUBBER NOTES.

These short notes are taken from the Bulletin de la Societé Centrale d' Agriculture Colonial. Para rubber trees cultivated at Andemaka in Madagascar, planted five metres (15 feet) apart have grown 2 metres and some over 2 and a-half metres (6 ft. 6 to 7 ft.) in two years. This plantation has a satisfactory appearance (We should hardly think so in the Straits).

Landolphia heudelotii is the only successful rubber in the Ivory Coast. The only cultivation it requires is to protect it against weeds. The latex is collected by the natives in calabashes and set with the acid of lime juice.

Another knife for tapping Para rubber trees is described in the Bulletin de Agricultura de Guatemala. It is in the form of a straight bladed parang bent downwards at an obtuse angle from the handle. The blade is a foot long and two inches wide, sharpened along the lower edge at the point nearest the handle and gradually thickening to the tip. A sheathing portion is screwed on to the blade so as to leave the cutting edge only just as deep as is necessary to cut through the bark without touching the cambium layer. The knife is drawn towards the user so that the cut enlarges gradually without tearing the wound. It is said that this produces an abundant flow of latex and the wounds heal rapidly. The instrument is known as the Rayador.

CASTILLOA SEED.

Mr. W. S. TODD, Amherst, Lower Burmah, writes:—That he has reduced the rate of Castilloa elastica seed to 20 rupees per thousand, fifty per cent. guaranteed to germinate. Delivery in August.

FICUS ELASTICA.

I have just tapped a tree and got 5 ozs. rubber first time, $2\frac{3}{4}$ ozs. second time. The tree is now dry. Age 4 years and 1 month. I think we can safely calculate on getting half a pound per tree in the sixth year. I should like to know if you are able to give me any information about any trees tapped at that age or near it.

F. A. CALLOWAY,
Bukit Rajah Estate, Klang.

(Can any correspondent give additional results on tapping Ficus elastica. Ed.)

ON THE CULTIVATION OF RICE AS A CATCH CROP.

I have been asked to make some notes on the above subject for the "Bulletin" but I can only pretend to give our own experience, (Lanadron Estate, Muar) based upon our harvest under a system which may or may not be applicable to other districts. In a country where the natural conditions are favourable for the cultivation of rice and where the amount produced is only an infinitesimal portion of that which is consumed, it seems to offer a good channel for energy and enterprise. But there are many difficulties natural and otherwise which have to be overcome and unless grown with other crops I cannot see how an European could succeed. I must mention that my remarks apply to "hill-paddy" only. To succeed it must be planted on a fairly large scale otherwise rats and birds do a great deal of damage. Then the handling involves a great deal of labour and unless the crop is large enough to warrant the use of handling and treating facilities, it entails too great an expense. I will endeavour to explain our "modus operandi" in the hopes that it may be of interest to some of the readers of the Bulletin.

First of all we select suitable fields, those that have little or no shade, supply the weeding contractor with nine tins (45 gantangs) of selected paddy seed with which he plants up the ten acre block and as he has a half interest in the crop, with very few exceptions the work is well done. Planting entails some expense as it requires a batch of men to plant up a field, but the contractor has to arrange for this. After about five months the harvesting commences and here a difficulty presents itself in consequence of the antiquated method of gathering, each ear of ripe grain being snipped off, one by one, with a small circular knife, after which the grain is thrashed by treading under foot and then winnowed in the usual primitive way. Last season this work entailed an extra hundred hands for the three hundred acres under cultivation and they were paid in paddy, *viz.*, one-fifth of that which they gathered. This season we have made arrangements to reduce this waste of labour by constructing small hand thrashing machines. The crop will be reaped with a "sabit" or reaping hook and the stalks put into the ma-

chine, which with an action of revolving beaters will knock the grain from the straw. The paddy will then pass straight into a gunny and be dispatched to the store, where it will be sun-dried, winnowed, weighed and stored in wooden bins. For drying we have made shallow trays, the bottom being a sheet of corrugated iron, each holding one gunny. This we find very convenient for handling and also the heat given out from the iron expediates the drying. The winnowing machine driven by power is one supplied by the Engelberg Huller Co., of Syracusse, U. S. A., which makes the paddy pass through a set of sieves, and, at the same time, the wind from a rotary fan contained in the machine and driven at a high velocity clears off all husk, straw, etc., the sieves retaining any pieces of stone, earth, wood, etc. that may have got in. The yield last season was 175 to 200 gantangs (22 to 27 bushels) per acre and this season we hope to get a better average partly by the fields being clearer of wood and partly by planting at increased intervals which should give a larger grain.

To have a stock of paddy is no doubt good, but it will not feed coolies and to have a gang of contractors on an estate with paddy is not advisable as a good deal of their time would be taken up husking it with the time immemorial pestal and mortar. To obviate this the hulling is done by machinery which I will explain hereafter.

As soon as the contractor has handed in all his grain, the division takes place and he receives a receipt for rice on his portion at the rate of 60 catties for each pikul of paddy. This is based on a 10 % reduction for machine expenses, *viz.*, a yield of 66 catties of rice per pikul of paddy. In some cases if properly handled the yield may be greater. To this remuneration must be added the value of the pollard or residuum which finds a ready sale amongst Chinese for feeding pigs, poultry, etc.

The hulling machine is also a production of the Engleburg Huller Co. and is called the "Engleburg Huller and Polisher" of which I can speak in the highest terms. The paddy being run into the hopper of the machine, falls on to a cylinder which revolves at a high speed and most effectually "hulls"—that is, rubs off the cuticle or outer skin and polishes the grain in one operation. The machine is capable of giving two tons of dressed rice per day. To this we have added a grader which is worked and fed automatically from the "huller" above.

Is it worth while to grow rice as a "catch crop"? I can only judge from our short experience here and the answer is in the affirmative. We have no occasion to import any rice now having more than sufficient until the next crop comes in and the surplus finds a ready sale locally. It will be understood that in being able to supply a good rice at a cheap rate is some help in getting and keeping coolies which perhaps is of more importance in an isolated position such as this, than in more favoured districts as regards labour and communications.

I have refrained from making any remarks as to the method and season of planting as this has been so often touched upon, but

rather endeavoured to confine myself to suggesting a method by which new estates could be made self-supporting as regards rice required to feed the coolies, which is no mean item in the year's expenses.

FRANCIS PEARS.

NEW PARA RUBBER FROM THE EAST.

(The following is from the "India Rubber World" of June 1st, 1902.)

At a recent auction sale in London six cases of fine Rubber from Ceylon, the product of cultivated trees from Para seed, brought 3*s.* 4½*d.* or about 81.4 cents, whereas the highest price for real Para rubber reported during the week was only 3*s.* 0½*d.* per pound. This is not the first instance of exceptionally high prices obtained in the London market for "Para rubber" from plantations in the East. The declining profits of coffee growing have forced the planters in that part of the world to seek some more remunerative planting, and already thousands of acres are covered with rubber trees under cultivation. Not unnaturally attention has been turned chiefly to Para rubber, on account of the universally higher price which it commands, and now that the first trees planted are becoming productive, the result of the sale of every little lot exported seems to the planters to confirm their choice. There is no computing how much planting of Para rubber since 1900 has been due to the sale of 327lbs. sent from Perak to London in that year at 3*s.* 10*d.*

It is not impossible that these planters may yet be disappointed, for the reason that it remains to be seen whether what they are producing is real "Para rubber". The tendency in nature is for all species to be influenced by change of habitat. It appears, for example, that trees of the genaus *Hevea,* the source of Para rubber when grown in the East, become productive at an earlier age than in the Amazon valley; again, it is stated that, while in the Amazon forests the seed pods of the Hevea uniformly contain three seeds, the number is irregular on the trees in the Malay States, and there are other indications of a tendency to "sport". It is possible that, under cultivation, the tree might in time develop different characteristics even in Brazil, where thus far it has existed only under natural forest conditions. Ultimately new species of *Hevea,* may exist as a result of change of soil and climate, and of transfer from forests to plantations.

We have already expressed our opinion of samples of the cultivated rubber from the Malay States, which, while attractive in appearance, do not really resemble the fine Para rubber now in use. It is much softer than the Brazilian product, and of much shorter "fiber". It could not be used, for example, in thread, elastic bands, or any fine pure gum goods. In solution it quickly loses its tenacity, so that it would not do for high grade cements. And it readily

softens with age. Perhaps some of these defects might be removed by the introduction in the East of the methods of coagulation employed in the Amazon rubber camps, but we are disposed to believe that the Eastern planters have really produced a new grade of rubber, and that the Para article can never be wholly duplicated by them. It is to be understood of course that the rubber is valuable, and will find a ready market at a price which is likely to yield a profit, but such samples as have reached us, valued from the manufacturer's stand points, would rank at least 25 per cent. below fine Para.

The good prices realised in London, doubtless, have been due to the cleanly appearance of the new rubber. And they have been based on the judgment of brokers, rather than results of practical tests in the factory. It would seem that the better course for the planters' associations would be, not to try to find how much money can be obtained in the open markets for their sample lots—which then become lost to sight—but to send them direct to a well equipped factory, to be made up in various forms of goods. The manufacturer's test is the one by which the value of this rubber will be judged finally, regardless of what may be the judgment of brokers to-day. We do not mean to dampen the enthusiasm of the planters, but there is such a thing as basing their plans upon estimates of profits that are impossible.

UNITED PLANTERS' ASSOCIATION, F. M. S.

REPORT FOR 1901.

GENTLEMEN,—Your Committee have the pleasure to submit to you the Fifth Annual Report of the United Planters' Association, F. M. S.

There have been three General Meetings, six Committee Meetings and one special Committee Meeting, all of them fairly well attended. Of the General Meetings, two were held in Selangor and one in Negri Sembilan. We regret to have to report that no support has been received from either Perak or Pahang this year, but hope to see an improvement in this respect during 1902. It has been suggested that, in Perak especially, where the distances are so great that it appears impossible to get regular meetings together, and to keep an association going, planters and other unofficial labour employers should obtain representation by appointing one of their members to treat with the Resident on all local matters. Such an arrangement, your committee feel sure, would be of great benefit to the residents in those States, and inasmuch as the Resident-General has already signified his approval, official co-operation may be regarded as assured.

Your Committee would suggest that by availing themselves of the existence of the U. P. A. F. M. S., as a medium of appeal, Perak and Pahang might further strengthen their own hands as well as greatly add to the sphere of usefulness of the parent body.

LABOUR.—During the past year, the weighty question of establishing a satisfactory system of recruiting free Tamil coolies from Southern India has very largely engaged the attention of the Government both in the Colony and the Federated Malay States, and of your Association. In the person of the Resident-General, Mr. TREACHER, your Committee feel that they have had a determined and always sympathetic official to deal with; no detail has been too insignificant to merit his attention; no mistake has been committed which has not been at once recognized and as far as possible rectified; your Association has always been granted a fair hearing when the efficiency of the kangany system has been impeached by those who do not sympathize or agree that it is the best, and on more than one occasion, the Resident-General has paid us the compliment of consulting us upon points whereon he has judged our advice likely to prove of service. Your Committee desire to place on record their emphatic opinion that having realized the important part that the Tamil Coolie is to play in the development of this Country, nothing could be more admirable than the sound, businesslike, and liberal manner in which the Government have faced the question, and endeavoured not only to master its theoretical aspect, but also to make it abundantly clear that they are determined to render what promises in the near future to be a labour market of the greatest importance, easily accessible to the enormous surplus population of India.

As instancing the strenuous efforts which the Government are making to bring about this desirable result, a few examples of what has been done during the past year will, your Committee feel sure, prove of special interest.

(*a*) Another agreement was entered into between the B. I. S. N. Co. and the Straits Government, by which the Company agreed to provide and maintain a fortnightly service of steamers between Madras, Negapatam, Penang and Singapore, connecting with the P & O Homeward and Outward Mails at Bombay, and to carry by these steamers up to 20,000 coolies in the year if called upon to do so, the rate up to 10,000 being eleven rupees per head between Negapatam and Penang, the Government guaranteeing to take 10,000 tickets and further paying the Company an annual subsidy of $50,000.

During 1901, your Committee regret to learn that 2,757½ tickets out of the 10,000 guaranteed were not issued, the F. M. S. share in this loss amounting to $18,584.24. It will be remembered that when the Government began to import coolies on their own account, a large number of poor wretches, of very indifferent physique, were sent over by the professional recruiters. To prevent a recurrence of this in the future a compulsory medical examination of all applicants was strictly enforced, the sole exceptions being coolies collected by the Government's own trusted agents and by the planter's kanganies. As a result of this policy, large numbers of applicants for tickets who in the past would have poured into this country to spread disease, and ruin the reputation of the Malay Peninsula as a desirable field for Indian labour, were rejected as

physically unfit. A very large proportion of these must have been prospective employees of the Government, yet rather than introduce people of this stamp, the authorities deliberately elected to incur the penalty of Rs. 11-0-0 on each coolie short of tbe 10,000 for whom tickets had been guaranteed. Your Committee venture to think that it would be a difficult matter to find a parallel in any country for such a resolute determination to do the right thing, in the face of serious pecuniary loss.

(*b*) A Straits official was appointed Superintendent of the emigration depôt in Negapatam. This gentleman, Dr. FOSTON, who has displayed the greatest energy since he assumed the reins of office, thoroughly understands the Tamil coolie. His post is no sinecure; Negapatam has been the happy hunting ground of a class of men, in the professional recruiters, who, whilst they have undoubtedly provided large numbers of coolies for this country, have never the less earned for themselves the reputation of being unscrupulous to a degree in their methods; bribery and corruption are rife amongst the subordinate native officials in the Madras Presidency; the police, the station masters, guards and porters on the railway, the peons about the Courts and even in the depôt itself, boatmen, all have in the past levied blackmail upon the unfortunate coolie, and the kanganies or recruiting agents who have been hardy enough to brave the professionals on their own field. Such abuses and many others Dr. FOSTON intends to remedy and it is with no hesitating or uncertain hand that he has set about his task; nor is his work confined to seeing that the coolie gets fairplay. He has to completely reorganize the whole recruiting system; the depôt accommodation has been practically doubled; here the wreay and footsore coolie may rest on arrival from his village before the time arrives for him to go on board, his caste prejudices are understood and respected and he is secure from outside interference. These and many other matters claim and receive Dr. FOSTON'S attention and your Committee, whilst realizing the great difficulties still before him, are satisfied that in every respect he is qualified to carry to a successful conclusion the onerous and responsible undertaking upon which he is engaged.

(*c*) That the coolie, upon arrival here may be properly looked after and in touch with a white man who knows his language and understands his ways, the Government have appointed your late Chairman, Mr. THOS. HESLOP HILL to be Protector of Labour for the Federated Malay States. Mr. HILL has already been over to India and has travelled through many of the coolie districts in the Madras Presidency, thus thoroughly qualifying himself, by a personal visit to the coolies in their own homes, for his task of supervision over here, and of rendering it, as far as may be, possible for his protegées to live under conditions which will be acceptable and attractive to them in this country. Mr. HILL when in India paid special attention to many important matters, such as food supply, hospitals, wages, additional travelling facilities and so forth, and your Committee hope, with his recently acquired information, and mature past experience, both with respect to coolies and their em-

ployers, that his appointment may in the future prove to have been one of the brightest features of the Government scheme for promoting a great and eventually spontaneous flow of Indian labour into the Malay Peninsula.

EMIGRATION TO THE STRAITS AND FEDERATED MALAY STATES.

Returns have been furnished showing that 8,790 coolies were collected and shipped by professional recruiting agents in 1901, and 1,099 by planters' kanganies. The past paddy season has been a good one in Southern India, and it has been in consequence more difficult of late to get coolies over, but on the whole, estates in Selangor and Negri Sembilan are fairly well stocked, though there are great complaints of shortage in Perak. There is no doubt a growing tendency in that State to employ Tamil labour on the mines, where wages are said to rule a good deal higher than on plantations, and to this fact may be attributed to some extent the shortage complained of.

The attached satistics of the population in the districts of the Madras Presidency and of emigration to this country in 1902 will be of value and interest.

POPULATION.

The Districts of the Madras Presidency served by the South Indian Railway are the following twelve, *viz.*, Madras, Chingleput, South Arcot, Tanjore, Trichinopoly, Coimbatore, Madura, Tinnevelly, North Arcot, Anantapur, Cuddapah and Nellore.

The following Table shows the principal statistics of these districts respecting their population :—

Districts.	Area in sq. miles.	Population.	Density per sq. mile.	Towns and Villages.	Ratio of population.		Percentage of thatched houses.
					Urban.	Rural.	
Madras	29	452,518	15,604	1	100.00	...	24.25
Chingleput	2,842	1,136,928	400	1,997	8 28	91.72	75.68
South Arcot	5,217	2,162,851	415	2,897	6.10	93.90	89.56
Tanjore	3,709	2,228,114	601	3,550	14.87	85.13	74.95
Trichinopoly	3,631	1,372,717	378	1,502	9.77	90.23	91.10
Coimbatore	7,860	2,004,839	255	1,478	5.50	94.50	76.40
Madura	8,808	2,608,404	296	4,108	9.23	90.77	89.79
Tinnevelly	5,387	1,916,095	356	1,538	17.20	82.80	89.62
North Arcot	7,616	2,180,487	286	4,465	7.26	92.74	81.38
Anantapur	5,275	708,549	134	941	9.77	90.23	27.69
Cuddapah	8,722	1,272,072	146	1,276	5.56	94.44	79.92
Nellore	8,765	1,463,736	167	1,793	5.57	94.43	91.09
Total...	67,861	19,507,310	19,038	25,546	19.911	100.89	891.43

INDIAN DEPÔTS.—The Government have been recommended to move the Negapatam depôt to Madras from which port it is suggested that the steamers should sail direct to Penang. This departure, however, your Committee venture to think would be an altogether ill-advised experiment. It seems sufficiently plain that in dealing with an ignorant but every conservative class of men, as the Tamil coolies undoubtedly are, many unfortunate misconceptions as to the change may arise, and emigration may be seriously impeded. Without in any way questioning the suitability of Madras for the purpose suggested, we none the less feel that the Negapatam depôt should certainly be maintained until the coolies have got accustomed to the Madras route, when, if it has in the meantime been demonstrated that the latter is beyond all doubt the best, the Negapatam depôt might be done away with. We desire to emphasize this opinion very strongly, for we consider that an issue of great importance is involved, at the same time we are sstisfied that the Government will not arrive at any final decision, without duly weighing the arguments for and against the proposals.

MALAY PENINSULA SUGAR INDUSTRY ASSOCIATION.—A letter was received last September from this body inviting the co-operation of your association in formulating "a scheme of recruitment of coolies in India." It was felt however that our interests in this question were divergent and that no good could result from an acceptance of the offer.

EXPERIMENTAL GARDENS.—In the early part of the year your Chairman was asked by the Resident-General to visit and report upon a block of approximately 72½ acres in the neighourhood of Sungei Rengum Estate, Batu Tiga, which had been selected and cut out by the Superintendent Experimental Plantations. The report sent in, whilst not suggesting that the land was in any way exceedingly rich, was in favour of the selection. Upon the matter being brought before the Association in meeting however, it was decided that an area of 72½ acres was insufficient for the purpose, and, one member who was well acquainted with the locality stating his belief that the block in question was quite unsuitable on the grounds that the remaining 127½ acres which had not been inspected were impossible to drain, it was resolved to ask the Government to postpone a final decision until a Committee of 5 members had visited and reported upon the whole 200 Acres. This suggestion the Government acceded to with the result that the block was condemned. Mr. W. W. BAILEY on behalf of the Selangor Rubber Company then offered the Government 200 acres of the Sungei Rengum Estate adjoining Batu Tiga Station, on certain terms which the Government accepted; the land was visited by a second Committee and reported to be suitable, and the gardens will be started as soon as the Government obtain a transfer of the land, a transaction, which, for various reasons, has been considerably delayed. In the meantime the Superintendent has started his nurseries on a piece of Government land adjoining the 200 acres. A special Committee consisting of the Chairman of the Kuala Lumpur Gardens Committee, Messrs. E. V. CAREY and C. MEIKLE, has been ap-

pointed to confer with and advise the Superintendent, and to render assistance in connection with work, which to him, as a comparatively recent arrival, may present some difficulties. Your Committee feel very strongly that the institution of this Experimental Plantation should prove of the greatest benefit to the cause of agriculture in this country and desire to express their recognition of the intention of the Government to keep Federated Malaya well forward in the van of the British Colonies and Protected States which already possess similar institutions.

AGRICULTURAL BULLETIN.—A brief reference was made in the last Annual Report to the probability of an Agricultural Bulletin being shortly published. The idea was very favourably received by the planting community throughout the Federated Malay States and a "band of contributors" was appointed consisting of Mr. CURTIS (Penang and Province Wellesley), Mr. DERRY and Mr. WRAY (Perak), Mr. ARDEN (Selangor), the Chief Forest Officer (Colony and Federated Malay States), and your Chairman. The Government of the Colony and the Federated Malay States each promised a grant of $300 per annum towards the expenses of publishing the Bulletin, the cost of which was fixed at $3 per annum, or 50 cents for a single copy, and the first number came out in October, since when there have been regular monthly issues. On the whole, your Committee think that the Bulletin has so far given satisfaction, but there is no denying that there is plenty of room for improvement, both as regards proof-reading and printing, and in the quantity of the local reading matter. It is annoying and discouraging to contributors to find their articles mangled by the omission or careless misuse of punctuation and so forth, and no complaints on this score should have even been called for, but with regard to the local contributions of reading matter and specimens, it is obvious that the remedy lies largely in the hands of the readers of the Bulletin, and those who hoped to find in it a useful medium for the exchange of ideas upon subjects of interest to the agricultural community. The Government initiated the idea of the Bulletin, they have given it considerable financial assistance and have permitted the use of the Singapore Government Printing Office in its production. With the object of rendering every possible facility, the Post Office are carrying free of charge all contributions marked "Agricultural Bulletin" and addressed to your Chairman, upon whom moreover has been conferred the privilege of franking correspondence throughout the postal system of the Colony and the Federated Malay States. More the Government cannot do, and it now rests with every member of the planting public to assist the Editor with material. Your Committee sincerely trust that this appeal for your support will meet with a generous response and that one and all will help in the good cause.

AGRICULTURAL SHOW.—The Resident-General in November last approached your Association with a view to ascertaining the opinion of the planting community as to the desirability of holding an agricultural show in the Federated Malay States during the current year. It was felt that the recent show in Penang, to which all

available Native States produce was sent, had proved to be of little practical value, and a reply was therefore despatched to the effect that the Association did not favour the proposal.

EXPORT Coffee to Europe.—With the idea of eventually placing regular monthly consignments of 100 piculs upon the London market to attract attention to our coffee, several of your members combined and sent a trial shipment of 80 piculs. This was bulked in the Port Dickson Co. Mills, and sold through Messrs. FRAME, Alston & Arbuthnot. The price realized was 32*s*. per cwt. which worked out to $17.78 per picul. This result was not sufficiently encouraging to provide any inducement for persevering with the experiment, and no further shipment of any size was made. A small parcel of 12 piculs was however purchased to test the respective merits of sun-drying and storing in Port Dickson and Aden; 7 piculs of this, which the Port Dickson Coffee Curing Co. took in hand, were sold in London at 30*s*. per cwt. whilst the 5 piculs sent to Aden realized only 26*s*. per cwt. There were grounds for believing that the Aden shipment was not properly looked after, and therefore no information of any value was derived. A large parcel of good 3-year-old Coffee was disposed of at $2 per picul less than No. 1 fresh from the plantations, and the idea has gained ground that to speculate by holding, on the assumption that coffee appreciates in value with age, is a very doubtful policy. There may be markets where old coffee is eagerly competed for, but Singapore is certainly not in touch with any of them. Reports from London Brokers favour shipments of coffee dried in the cherry before peeling, and report such coffee to be sweet and suitable for home consumption, but it is suggested that a market for this description must be gradually built up, and no shipments of any size are known to have been made.

YIELD of COPRA.—In response to a request for information on this subject, the Manager of the Singapore Oil Mills kindly favoured us with the following communication which your Committee think they cannot do better than reproduce "in extenso."

E. B. SKINNER, Esq,
Secretary,
The Planters' Association, Singapore, Oct. 11th, 1901.
Selangor.

DEAR SIR,—I am in receipt of your letter of the 19th ult. *re* the various copras and their comparative yield of oil.

The copras arriving in Singapore usually go under the name of the Island or State they come from, as for instance Bally, Macassar, Selangor, Kelantan, etc. etc. These copras are more or less the same, the real differcuce being that while some qualities are made from ripe and fully matured nuts, others contain 50% of copra made from half ripe nuts, consequently the yield of oil from the latter is much below that of the former.

Formerly Bally copra was recognised as the standard for "Sun-dried Quality." It was thick, dry, and rich in oil. Evidently great care was taken in only picking the ripe nuts, and it was properly

dried before being packed. This copra has fallen from its first position and is now very inferior, being no better, if as good, as the poorest qualities.

Some samples of copra from Penang and Kelantan have given good results but, as mentioned above, all depends on the percentage of unripe copra in the parcel, and where you may get one shipment with say 5% of unripe in it, the next lot from the same place and dealer may have 50%

Occasionally a small parcel will arrive from the Nicobar Islands. This copra is evidently made from a nut much smaller than those usually seen in Singapore, the kernel is very thick and rich in oil. Our Chinese dealer says it is made from the "Klapa Raja."

Ceylon copra is also noted for its richness in oil, yielding about 3% more oil than the Straits article.

Yours faithfully,
(Signed) Manager,
The Singapore Oil Mills.

PUBLIC AUCTIONS.—Beyond a definite settlement with Messrs. Barlow & Co. of the lines upon which public auctions are to be worked as soon as that firm judge that the time has arrived for a start to be made, nothing in this connection has been done, and all coffee, during the season under review, has been disposed of by private sale. A recent letter from Messrs. Barlow & Co., sums up the situation "We are practically ready to start public auctions, but we have hesitated to experiment on an already unsatisfactory market. If your Committee instruct us to make a beginning we will be glad to follow their instructions. Supplies are now falling off, and it might be well to give the sales by auction a trial in the quiet months of this year. We would suggest giving a month's notice of the first sale, accumulating the arrivals for three weeks, and issuing the catalogue a week before the sale." Your Committee do not advocate that the Association should take the first steps, but consider that Messrs. Barlow & Co. should be left to use their own discretion as to the best opportunity for giving sales by auction a trial.

RUBBER IN MEXICO.—On the 24th October your Chairman addressed a letter to H. B. M. Consul, Mexico City D. F. Mexico, asking for further information regarding the "wild rubber" in Mexico and any cultivated varieties in that republic, but so far no reply has been received although your chairman's letter was the outcome of a communication from the Consul to the Singapore Chamber of Commerce.

RHEA FIBRE.—The cultivation of this product has attracted little or no attention during the past year, owing mainly to the uncertain market for ribbons. Upon information received from Sir F. ABEL, Director of the Imperial Institute, to the effect that a firm of high standing in London were prepared, for several years to come, to purchase Rhea ribbons at £15 per ton, the Government, by notification in the different Gazettes, gave wide publication to this offer. When a member of your Association however interviewed the firm

in question in London, he was told that they would take 100 tons at £15, after which they could not guarantee a price. Such a rapid change of front was not allowed to pass without comment, and your Committee are pleased to be able to report that H. E. the Governor considered the matter of sufficient importance to refer to Sir F. ABEL, who has dealt with the complaint in a manner leaving nothing to be desired.

MEMORIAL TO SECRETARY OF STATE.—The fact that the Government of India, were planting up a large area in Para Rubber (Hevea Braziliensis) was already engaging the attention of your Association, when a communication was received from the Secretary of the Ceylon Planters' Association stating that a memorial on the subject had been forwarded to the Secretary of State for the Colonies by that body, and inviting our support. The subject was one of such obviously pressing importance that a similar memorial was, with as little delay as possible, drawn up and despatched through the Resident-General to the High Commissioner for transmission to the Colonial Office. We have since heard that the reply received by the Ceylon Planters' Association was unfavourable, but we have hopes that the additional arguments adduced by us, and the great prospective value of the Rubber industry to this country, may induce the Secretary of State to consider the subject afresh.

JOSEPH CHAMBERLAIN, M.P.,
His Majesty's Secretary of State,
For the Colonies,
Downing Street, London,

THE HUMBLE MEMORIAL OF THE UNITED PLANTERS' ASSOCIATION OF THE FEDERATED MALAY STATES.

Respectfully Showeth.

1. That your Memorialists desire to bring under your consideration the intention of the Government of India to plant up 10,000 acres in the Mergui Division of Burmah with the Para Rubber tree (*Hevea Braziliensis*).

2. That, whilst it is stated by the Revenue Secretary to the Government of Burmah that this proposed scheme on the part of the Government of India is in the nature of an "experimental measure," your Memorialists desire to point out that the acreage referred to is at least equal to, if not in excess of, the whole area planted by private enterprise in the Federated Malay States and the Straits Settlements.

3. That for the last five years the cultivation of Para Rubber has been progressing steadily in this country, and promises in the near future to be the main agricultural staple. Owing to the continued depression of the coffee market, the Liberian Coffee Estates of this Peninsula have been almost without exception planted up with Para Rubber, in the same way that Cinchona and Tea were planted, with such successful results to that Colony, on the Coffee Estates in Ceylon; at the same time, a considerable area of virgin forest has

also been brought under cultivation with this product in the Federated Malay States.

4. That in the Botanical Gardens of Ceylon and the Malay Peninsula, Para Rubber trees, of a sufficiently mature age, exist in sufficient numbers to render it apparently unnecessary for the institution of an experimental garden of anything like the dimensions as that which forms the subject of this memorial.

5. That your Memorialists directly contribute to the revenue of the Federated Malay States by paying an *ad valorem* export duty of $2\frac{1}{2}$ per cent. on all agricultural products, in addition to payment of rents and premiums for land; that further, in certain cases special arrangements have been made with the Government whereby it is incumbent upon land owners to plant up the whole of their concessions with rubber within a period of ten years.

6. That your Memorialists submit that the production of so large an amount of Para Rubber by the Government of India must result in serious competition with private growers, who have, under already existing circumstances, to contend against an enormous supply from the indigenous rubbers of other countries.

7. Wherefore your Memorialists pray that His Majesty's Government may take any necessary action in the matter, and your Memorialists will, in duty bound, ever pray.

On behalf of the Memorialists,

(Sd.) E. V. CAREY,
Chairman.

(Sd.) E. B. SKINNER,
Hon. Secretary.

CATCH CROPS.—Very little success has attended the efforts of those who have endeavoured to keep down expenditure by the cultivation of subsidiary products. The outlets are too small and markets are in consequence easily swamped. As long as prices keep up, the Chinese sub-lessees will maintain their kladdie or pumpkins, as the case may be, in fair condition; but directly a slump occurs, they cease to weed and indeed to put any more labour into the undertaking at all, with the result that the Superintendent has to devote a lot of valuable time to trying to get things straight, and usually meets with very indifferent success. It is generally recognized now that if more than one product is to be cultivated upon the same ground, the best combination is Coffee and Para Rubber, the former planted close, to yield maximum crops within a limited period, and the rubber at whatever distance may most commend itself to the individual proprietor.

INSECT PESTS.—White ants have done a lot of damage to Para Rubber, Ficus Elastica and coconuts, in the coast districts especially, during the past year, but continuous digging and disturbance of the soil appear to disorganize them and keep their attacks within bounds. Coconut beetles have been plentiful and their collection has proved a very costly item. There is no doubt that the provisions of the Coconut Preservation Ordinance are not being strictly enforced, and your Committee hope ere long to see an intelligent

and sustained effort on the part of the authorities to rid the country of these pernicious insects, which, if not dealt with systematically, render a cultivation that should be attractive in appearance as well as lucrative, little better than a hideous eyesore. In this connection much assistance might be rendered to the Government by planters reporting every case which they may observe of trees being neglected; at the same time there are so many instances of groves of coconuts, actually within town limits, being riddled through and through with beetle and never attended to, that it is difficult to realise that any ordinance providing for their extermination exists at all. The Bee Hawk moth has reappeared in numbers on several Estates, principally in the Klang district, and though moths, chrysalids, caterpillars and eggs have been steadily collected and destroyed, a considerable loss of leaf has been experienced. So far, hand picking, and catching the moths in nets, have been the only methods employed in fighting this pest, and as the moths are day and not night insects, their capture by the medium of powerful lamps is of course not feasible. This method is however to be tried with respect to coconut bettles, and the result will be awaited with great interest. Ficus Elastica borers and several different kinds of caterpillars have been reported, but only in comparatively small numbers.

Chief Planting Products.

Coffee.—The export returns for Perak, Selangor and Negri Sembilan show an increase in 1901 of 6,476 piculs, this must be considered a satisfactory result in view of the fact that prices averaged $18.29 per picul as against $20.80 in 1900. Moreover, exchange fell from 2/- (demand selling rate on London) in January to 1/10⅛ in December, but for which fact, dollar quotations would presumably have been lower still. A good deal of Coffee has nevertheless been planted in 1901, mostly in conjunction with Para rubber, and cultivation has been well maintained, whilst quality has improved, and complaints on this score have been much less frequent. Reports from Brazil go to show that the coming season's blossoms have to a great extent failed and there is a widespread belief that 6,000,000 bags will be the limit of the crop actually gathered in Rio and Santos, though the unloading of heavy stocks may to a great extent counteract the hardening effect which such a phenomenally poor crop should exercise upon the market. It is a somewhat debatable point whether the failure of the blossoms in Brazil is to be attributed to the impoverished condition of the trees, consequent upon inadequate cultivation and a succession of abnormally heavy crops, or whether the season has been unpropitious. If the former assumption be correct, then there can be little doubt that a steady and continued improvement may be confidently anticipated, but advices are so conflicting that it would be premature in the extreme at this stage to attempt any reliable forecast.

Coconuts.—Owing to the ravages of beetle and the cost of keeping the trees clean, Coconuts are not as much planted as their

fine growth would lead one to suppose that they would be. Doubt has also been expressed as to whether the soil, except that actually on the sea-board, is suitable. The Selangor Planters' Association Annual Report however states, that on a small holding in the Klanang District, trees from 11 to 12 years old, have yielded an average return of over 51 nuts per tree, although this plantation was opened by Malays and considerably neglected during the first eight yea's of its existence. Such a return is under the circumstances decidedly satisfactory, and your Committee are of opinion that the cultivation will always be a remunerative one as long at it remains possible ts keep the beetles under, without incurring a prohibitive expenditure in doing so.

GUTTA RAMBONG (Ficus Elastica).—The unsuitability of this tree for planting amongst Coffee, to some extent accounts no doubt for the preference shown to Para. Nevertheless when put out on soil which it likes, growth has been very fine, but it has shown itself to be a tree which will not flourish anywhere and everywhere, and for it to make a vigorous start it appears essential that there should be a fairly rich surface humus or lots of ash after a recent burn. On rain-washed and impoverished hill-sides, it sulks from the day it is planted, but grows splendidly on practically bottomless peat, if well drained. Mr. Derry of Perak has interested himself more than anyone in this variety of rubber, and is very sanguine of its eventual success, though he thinks that "perhaps eight years may have to elapse before the tree can be profitably tapped." In Malacca 4-5 years old trees are however being worked by a Chinaman who professes to be quite satisfied with the results, but his figures of yield and cost are considerably involved and difficult to follow. In Perak two 19 year old trees each yielded 25 lbs. in one year, and of these Mr. Derry reports "the tapping was far short of being exhaustive." The value of this rubber is slightly less than Para, and the method of collection differs, in that the latex of the "Ficus" appears to coagulate on the trees, whereas that of Para runs freely, down the cuts made in the bark, into tins.

HEVEA BRAZILIENSIS.

PARA RUBBER.—With the decline in the price of coffee this product have been largely planted throughout the Federated Malay States, and when kept clean of weeds has everywhere come on in a fashion which clearly indicates that soil and climate agree with it admirably.. The wintering habit of this tree, which is almost universal, seems to afford a further proof of this country suiting it. Some experimental tapping of young trees, which has been undertaken, goes to show that in 4 to 5 years from planting about 6 ozs. of dry rubber may be regarded as the average yield of the best grown trees, and some 6 year old trees have yielded over a pound at their first tapping. The coming year will undoubtedly provide many returns of experiments for comparison, but at the present juncture very few Estates have any large number of trees ready for tapping.

The accompanying extract from the Imperial Institute Journal will be of interest:—

Rubber output of the Amazon Valley. The United States Consulate, Para, reports that at the close of 1901, the receipts of rubber at Para were nearly 30 per cent. greater than ever before at that season. Business was good in 1900, Exchange low, and credits easy. The labourers and middlemen indulged in many luxuries. The end of the season found the crisis at hand, Exchange rising rapidly, the gatherers deeply in debt, and the price of Rubber reduced 20 per cent. Now they are making a desperate effort to pay off this indebtedness and make a fresh start. They are getting a large proportion of their food from the streams and forests by hunting and fishing: they are purchasing only absolute necessities; and are working overtime to increase the crop and liquidate their bills. It was reported in December that there were on the way down the river from the upper tributaries of the Amazon, about 700 tons more rubber than had ever before been shipped from that section in one season, and that there were at least 200 tons more to follow. About 30 small steamers and launches left Para and Manaos for the Acre, Jurua, Purus and Beni rivers and were due to return to Para in February. Altogether, adds the Consul, there is reason to believe that this season's rubber crop will exceed that of last year by a very considerable margin.

The Selangor Planters' Association have made Para Rubber a special feature of their 1901 report, and your Committee think that they cannot do better than reproduce what has been already said upon this subject, heartily endorsing the warm appreciation of Mr. Derry's valuable work to which the Selangor Planters give expression.

EXPORT OF COFFEE, F. M. S.

	1894	1895	1896	1897	1898	1899	1900	1901
Selangor pkls.	2,588	4,532	7,046	12,491	22,948	26,407	34,295	37,664
N Sembilan ,,	unknown	unknown	unknown	1,071	3,163	4,541	6,199	9,769
Perak ,,	1,362	1,937	2,209	2,759	2,837	932	4,269	3,806
Total ,,	3,956	6,469	9,255	16,321	28,948	31,880	44,763	51,239

Negapatam Emigration Depôt Returns, 1901.

	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
Coolies recruited by professional recruiters.	720	658	430	714	1,012	1,415	1,617	564	426	398	348	418	8,790
Coolies recruited by kanganies...	9	11	20	108	127	136	89	112	200	120	65	102	1,099
TOTAL ...	729	669	450	822	1,209	1,551	1,706	676	626	518	413	520	9,889

NEGRI SEMBILAN PLANTERS' ASSOCIATION.

ANNUAL REPORT, 1901.

GENTLEMEN,

We, your Committee herewith place before you our Fifth Annual Report.

MEETINGS.

1. There have been two General and three Committee Meetings. Three new Members have been elected, two of these being Chinese gentlemen who are largely interested in the cultivation of tapioca.

CULTIVATION.

2. (*a*) COFFEE.—At the present time prices show again a downward tendency after having risen to $22.50 in December, this is a great disappointment as from home advices the enhanced prices appeared to be likely to be maintained and a better time in store for planters, it now, however, appears that the advices from Brazil were as usual inaccurate.

There seems to be a general feeling prevalent amongst those best informed on the subject that the treatment of our coffee by the wet process is likely to be superseded by a dry system without fermentation.

Caterpillars.—These as predicted in our last Annual Report have not entirely disappeared, but the sharp eye now kept on them will probably prevent them again assuming the proportions of a pest.

(*b*) COCONUTS.—We are glad to notice that the Government have begun to enforce the Ordinance in some districts, in others there still remains much to be done: we trust that the Government will see that the Forest Officer has the Ordinance efficiently carried out. Prices for nuts for local consumption are high, as much as seven cents having to be paid now per nut in Seremban (retail). Although it is well known to local planters that coconut cultivation offers a most profitable field for investment, practically no extensions can be recorded: this is no doubt owing to the fact that our members have already invested all their available capital in other products; consequently we cannot help thinking that Government might with advantage to itself advertise at home say the grant of free blocks of land for this cultivation with a view to attracting new blood and capital into this State.

(*c*) PARA RUBBER.—This appears likely to be the salvation of the coffee planter. On most estates it will be found planted through the coffee to which it appears to do very little damage. Recently two well known Ceylon planters who are largely interested in Para cultivation in that island have visited this State, they seemed to be very pleased with the prospects of Para in this country and to think that the trees here when compared with those of a like age in Ceylon showed freer growth.

The price of Para has fallen from over 4/- to 3/3, this we think need occasion no alarm, no one we imagine ever expected such high prices to be maintained; and it must be remembered that the very fall in price creates its own extra demand till no doubt all rubber goods will be purchasable at popular prices.

(*d*) Rambong Rubber.—Members are turning their attention more to this cultivation: so little at present is known in practise of it, that your Committee would not care to prophesy. At present as far as is known the rubber is of a superior quality, but tapping appears difficult in the case of young trees.

(*e*) Getah Taban.—Since the last Annual Meeting this Association has approached Government as to the ownership in trees existing in forest reserves belonging to Members. This question has not yet been settled, as the matter being one which concerns all the States of the Federation has had to be referred to the Resident-General. Your Committee do not anticipate however that Government will claim any ownership in trees which members have taken the trouble to cultivate (*i.e.*, clear round) as when so treated they can hardly be considered to come under the heading of jungle produce.

Labour.

3. Your Committee regret to have to state that labour appears to be scarcer, more difficult to obtain, and more expensive to import (owing to the changed relations of rupee and dollar) than ever before. Members who have hitherto during over ten years experience had no difficuly in satisfying their requirements now for the first time are unable to do so.

Even statute Immigrants it appears to be impossible to obtain, one of your Members has given orders for these coolies to two different firms, but in both cases the firms in question have declined to accept the order owing to the impossibility of fulfilling it. Under such circumstances it appears desirable that Government should in conjunction with the various Planters' Associations appoint a Committee to enquire into the reasons for this scarcity. From private sources we hear that recruiting of statute labourers for both Mauritius and Natal is going on briskly in Southern India and that prices for these coolies rule high: this may be one of the reasons for the shortage, but it cannot be the only one.

Timber and Jungle Produce Rules.

4. In accordance with the powers conferred upon the Resident-General by the provisions of the Land Enactment 1897 a set of rules under the above title were published in the *Government Gazette* of February 28th, 1902. Your Committee consider that it is a matter of regret that these rules were out whilst in draft submitted to this Association and other Members of the community who are interested in timber business, as they might have made useful and practical suggestions which would have tended to avoid any possible friction in the future.

NEGRI SEMBILAN PLANTERS' ASSOCIATION.

Labour and Cultivation return. Figures correct 31st January, 1902. Year 1901—1902.

Name of Estate.	No. of Coolies. Tamils.	No. of Coolies. Malays.	No. of Coolies. Chinese and others.	Area Coffee only.	Area Coffee planted through with Para.	Area Coffee planted through with Rambong.	Area Coffee planted through with Para & coconuts.	Area Coffee planted through with Coconuts.	Area Para only.	Area Rambong only.	Area Coconuts only.	1—What area to be opened in 1902. 2—If any? what cultivation.
Perhentian Tinggi	40	50	...	250	40	...	...	...	20	...	...	...
Terentang ...	120	...	30	...	350	...	...	...	...	...	5	None
Senawang ...	70	...	25	100	...	200	...	...	...	...	...	do.
Ayer Silolo / Ayer Angat	70	...	...	...	350	...	...	50	...	...	...	do.
Seremban ...	100	15	25	...	420	...	...	...	...	...	...	do.
Bukit Nanas ...	37	...	...	...	133	...	...	...	5	...	45	do.
Negri Sembilan	36	45	...	...	...	...	...	...	173	147		1—134 Acres 2—Rubber
Ainsdale ...	50	10	...	10	...	...	...	130	100	...	50	None
Glendale / Cheviot	180	23	67	...	380	30	...	10	30	...		1—40 Acres 2 Tea, Cocoa-Camphor & Cardamons
Ulu Sawak ...	75	10	...	90	110	...	...	...	...	...	...	None
Kauchong ...	...	...	...	...	150	...	...	...	5		...	do.
Linggi ...	300	...	...	200	110	...	...	...	10		20	do.
Linsum ...	200	4	6	...	389	...	...	...	2	...	4	do.
Atherton ...	220	2	1	...	300	180	...	...	...	...	...	do.
Siliau ...	...	...	...	...	...	...	...	...	100	...	...	do.
Leigh ...	60	10	...	...	120	...	...	...	...	...	128	do.
Ribu ...	100	...	...	...	...	...	250	...	...	...	...	do.
Lukut Kechil ...	...	20	...	...	...	...	...	...	...	...	125	do.
Landquart ...	5	...	...	...	...	...	...	...	...	...	60	do.
Jellani * ...	...	...	...	...	...	...	...	...	...	...	...	...
Total. ...	1,663	189	154	650	2,852	410	250	190	445	147	437	1—174 Acres 2—134 Rubber, balance Tea, Cocoa, Camphor and Cardamons.

* N. B.—Jellani Estate returns ommitted as no answer was received to Circular.

ANNUAL GENERAL MEETING OF THE UNITED PLANTERS' ASSOCIATION, F. M. S.

This meeting was held at Kwala Lumpur on May 3rd:—Messrs. Carey (Chairman), T. H. Hill, C. Meikle, W. R. Rowland, E. B. Prior, P. W. Parkinson, J. G. Glassford, O. B. Pfenningwerth, J. M. Halliday, A. M. Barnwell, A. Irving, M. S. Parry, E. B. Skinner; Visitor,—J. L. Anstruther; By Proxy,—S. Moorhouse.

The minutes of the previous meeting having been confirmed, the Chairman read letters received dealing with the Indian Immigration question, also with the action taken to appoint a Committee to make suggestions and offer advice direct to the Superintendent of the Experimental Gardens on the subject of auction sales of Coffee. Mr. Parry stated that according to the Weekly Circulars issued by Messrs. Barlow & Co. almost every body receives the same price for their coffee when selling on similar dates, and it is well known that samples from some estates are not as good as others. This did not seem a satisfactory state of affairs.

The Chairman said that a letter had been received from the Resident-General, to the effect that the Ceylon Planters' Association Memorial had been submitted to the Secretary of State for India and that there did not appear to Lord George Hamilton any sufficient ground for making a representation to the Government of India, and the same statement applies to the Memorial of the United Planters' Association.

Mr. Meikle proposed that the Government should be asked to take steps to eradicate the Coco-nut beetles which were doing much harm in Selangor, especially in Kwala Lumpur and Klang. Mr. Darby in seconding the motion said that trees ranging from 18 months to two years old were riddled by them at Klang, and suggested the employment of Government Inspectors. Mr. Hill stated that when Mr. Birch was Resident in Negri Sembilan, the Planters Association approached him on the subject, steps were at once taken and there are now very few places suffering from beetles. The resolution was carried unanimously. A vote of thanks was proposed to the retiring Chairman, after which Mr. Parry taking the Chair, Mr. E. V. Carey was re-elected Chairman and Mr. Darby Honorary Secretary for the ensuing year.

CORRESPONDENCE.

FICUS ELASTICA.

The Editor

AGRICULTURAL BULLETIN.

Dear Sir,

I hope to see many answers to Mr. Irving's interesting inquiry as to the desirability or otherwise of lopping Rambong trees when young and of keeping them to a single stem plus one or two sturdy aerial roots.

On Bukit Rajah Estate in Klang, we have a large number of

Rambong trees approaching 4 years of age, and the early treatment of these trees has naturally been a subject of much concern to the management. We take it that at three years of age our trees in this particular locality are about 25 feet in height and have a spread of about 30 feet in diameter, the foliage being almost impenetrably dense and reaching right down to, and in some cases, spreading out along, the ground. The soil is of course the richest drained alluvial, and the trees are apparently much more at home in it than on the hills, where the growth is very much slower, and nothing like the same quantity of leaf is to be seen. I mention this particularly because it seems to me that this dissimilarity in growth renders it probable that treatment which suits our Rambong on the flats may not be the right thing for hill cultivation, and it will therefore be of great value if we can collect information from those who have experience of both.

I have found that cutting off the lower branches, pruning (to lighten the head) and removing the smaller aerial roots does undoubtedly give the tree a shock and checks its growth, as Mr. Irving says, and, for some time past, because we did not know what to do and could not find out our trees have been left to themselves, to grow as they chose. Mr. Thos. North Christie of Ceylon, who was over here recently, was very interested in this question, and we were able to show him several trees, which, upon parting the leaves and branches and pushing our way in, we found to be "casting" numbers of both branches and aerial roots. It seemed as if these were absolutely smothered by the dense shade and rotted off quite naturally by themselves leaving it a comparatively easy matter to move about, when once inside, round the stem and main branches of the tree. Some of the branches which were thus dying off were as thick as a man's wrist, and it was perfectly obvious that the trees were thorougly healthy and that this singular condition was merely an effort of nature and not a result of disease.

We are still watching developments and not touching our trees with the knife at all, and my belief is that we shall have an infinitely bigger tapping area to work upon, when we once get to work in earnest, than if we had trimmed our stems up; whether the latex will be as rich in caoutchouc, when collected from the thick branches as well as the aerial roots and stem remains to be seen, but I am sure the yield must be far heavier.

It may be of interest to your readers to hear that a tree on Bukit Rajah, under 4 years old, has just been tapped and yielded in two days, half a pouud of dry scrap rubber—stem, branches and aerial roots were scored all over with a sharp knife, the rubber being peeled off from the cuts the next day; on the third cutting the flow of latex was so poor, that the tree was left alone for the time being; no damage at all was done by the cuts and in a month hence, I hope to see the treatment repeated.

Yours faithfully,

E. V. CAREY.

TAPPING PARA RUBBER.

INCH KENNETH ESTATE,
KAJANG,
Selangor, 28th June, 1902.

Dear Sir,

I enclose some notes on Tapping Para Rubber which may be of interest.

The trees tapped were just 6 years old. I was not very successful in turning out a first class sample as I tried to dry the rubber in too thick pieces and consequently it retained a certain amount of moisture. I have since seen the process of drying in thin biscuits which appears better in every way.

Yours faithfully,
R. C. N. KINDERSLEY.

H. N. RIDLEY, Esq.,
Editor,
The Agricultural Bulletin,
Singapore.

P. S.—I fancy with a proper tapping instrument that better results would be obtained. My trees were operated on with an ordinary pocket knife.

Tapping of 5 trees on Inch-Kenneth Estate, Selangor, January, 1902:

Age—6 years.
Seed—Botanic Gardens, Singapore.
Girth—About 3 feet.
Tapping—15 consecutive days.
Time—From 6 a. m. to about 9.30 a. m.

Result—Solid rubber	- - lbs.	5.00
Scrap rubber	- - „	0.10
Total	- lbs.	5.10

Average per tree—1 lb. 2 ozs.

The trees were tapped on the herring bone system. The side cuts being widened daily. Notwithstanding the cutting having been done roughly the trees look none the worse.

RAMIE.

JUGRA ESTATE,
SELANGOR, *June 9th, 1902.*

Dear Sir,

I have just received *Agricultural Bulletin* for May and am very interested on the Ramei notes contained therein.

I have tried the Farm and other processes. I studied the Farm under the inventor at Limagu and now have one of his machines here. I have never found that I could get a *regular* market for any variety of the produce but I never quite despair of what Mr. Curtis describes as the "King of Fibres."

Sir Edward Lawrence who is referred to in Letter I is the head of the firm which employs me (Messrs. Edward Lawrence & Co.) and under their auspices I conducted the most exhaustive experiments in fibre, ribbon and even netting which I believe have ever been conducted on a large scale, in this part of the world.

I still have 30 acres under ramie (Bechmeia Ninea) and I could supply roots—a good many tons—at (say) ten rupees per cwt., delivered to any Agent in Singapore, at any time.

Yours sincerely,

CYRIL E. S. BAXENDALE.

NOTES.

SELANGOR PLANTERS' ASSOCIATION.

At a meeting of this Association, held at the Selangor Club on April 5th, it was decided that the Association should be dissolved and amalgamated with the United Planters' Association.

SINGAPORE FLOWER SHOW.

Owing to the very poor public support accorded to the Committee of the Flower Show, it was decided to abandon the Exhibition this year.

NOTICE.

(1).

The Para Rubber trees in the Botanic Gardens, Singapore, are now commencing to produce the seed crop. Planters who have put their names down in previous years for seed, and no longer want any, are requested to write to the Director to inform him.

(2).

Correspondents acknowledging the receipt of Bulletins are requested to Stamp their letters fully, as a large number of letters have been received from various parts of the world either not stamped at all, or insufficiently stamped.

(3).

All applications for Bulletins should be made to the Editor who will also receive subscriptions.

(4).

Owing to the misunderstanding on the part of certain Subscribers as to the date in which the Bulletin is published, this number is dated August, previous numbers having been ante-dated.

SINGAPORE MARKET REPORT.

May, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	34.00	33.00
Bali	...	24.00	24.00
Liberian	242	19.50	18.50
Copra	2,916	11.25	9.80
Gambier	2,220	13.65	12.62½
Cube Gambier, Nos. 1 & 2	250	22.50	17.00
Gutta Percha, 1st quality	...	600.00	350.00
Medium	...	400.00	200.00
Lower	...	200.00	50.00
Borneo Rubber	...	130.00	72.00
Gutta Jelutong	...	6.50	5.75
Nutmegs, No. 110's	...	49.00	48.00
No. 80's	...	78.00	72.00
Mace, Banda	...	105.00	95.00
Amboyna	...	75.00	75.00
Pepper, Black	670	32.75	30.62½
White	164	58.00	55.00
Pearl Sago, Small	...	5.00	4.65
Medium	...	5.00	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	3,374	3.95	3.60
No. 2	332	1.95	1.85
Flake Tapioca, Small	632	6.75	5.15
Medium	37	6.00	5.25
Pearl Tapioca, Small	672	6.87½	5.30
Medium	920	7.00	4.90
Bullet	...	6.75	6.25
Tin	3,105	93.50	88.25

London Markets.

Arrowroot.—A few hundred barrels of fair manufacturing quality of St. Vincents have been sold at 4*d*. per lb. We note a further arrival of 500 barrels.

Coca Leaves.—Good green Truxillo are quoted 9*d*. per lb., net. During March 695 bales were shipped from Java, of which 655 went to Bremen and 40 to Holland. The shipments from Jan. 1 to March 31 have been:—

	1902.	*1901.*	*1900.*	*1899.*	*1898.*
Bales	1,090	75	150	93	265

Cocoa-Butter.—The result of the auctions held at Amsterdam on June 3rd was as follows: seventy tons Van Houtens sold at

$64\frac{3}{4}$c. to $68\frac{3}{4}$c. per half kilo. (average price 67 10c., against 67 70c. at the previous auction); 13 tons de Jong at $62\frac{1}{2}$c. to 63c., while of 13 tons Mignon offered, 1,200 kilos. sold at $62\frac{1}{2}$c. per half kilo. In the London auction, 60 tons Cadbury's brand sold at from 1*s.* to 1*s.* $0\frac{3}{8}$*d.* per lb., average being 1*s.* $0\frac{1}{16}$*d.* against 1*s.* $0\frac{1}{8}$*d.* at the previous auction.

Cubebs.—The export of cubebs from Java during March amounted to 182 piculs, of which 166 were shipped to Singapore and 16 to Rotterdam. The shipments from January 1st to March 31st have been:—

	1902.	*1901.*	*1900.*	*1899.*	*1898.*
Piculs ...	635	568	504	664	212

Gambier.—Cubes are quoted 40*s.* per cwt. spot, which figure has been paid for small lots.

Oil, Castor.—The value of Calcutta seconds is $2\frac{3}{4}$*d.* per lb. and small sales are reported thereat. A report from Calcutta, dated May 15, states that the demand has somewhat improved, but sales are retarded, owing to crushers generally not accepting the prices offered.

Oil, Lemon.—Genuine is quoted 2*s.* 7*d.* per lb., c. i. f.

Oil, Orange.—Sweet is quoted 5*s.* 4*d.* to 5*s.* 5*d.* per lb. c. i. f.

Vanilla.—The large supply of 1,250 tins was offered at auction on Tuesday, when over a thousand were sold, common and fine being dearer, while medium were irregular but easier. Fair to good chocolate Seychelles, 7 to $8\frac{1}{2}$ inches, sold at from 14*s.* 6*d.* to 19*s.* 6*d.*, 5 to 7 inches, 7*s.* 3*d.* to 15*s.*, 4 to $6\frac{1}{2}$ inches, 6*s.* 9*d.* to 11*s.* 6*d.*, $2\frac{1}{2}$ to 4 inches, 6*s.* to 7*s.* 6*d.* per lb. Mauritius 7 to $8\frac{1}{2}$ inches, from 16*s.* up to 22*s.* 6*d.*, $3\frac{1}{2}$ to $6\frac{1}{2}$ inches, 6*s.* 6*d.* to 14*s.* per lb. *Chemist and Druggist, June 2, 1902.*

Cocoa.—Auction on Tuesday offered 5,895 bags, which experienced a good demand, and about 3,400 bags changed hands at very full prices to an advance of 2*s.* per cwt. Of 1,244 bags Trinidad catalogued, 1,090 bags sold at a rise of 1*s.* to 2*s.*, good to fine red 64*s.* to 68*s.* 6*d.*, ordinary to middling 60*s.* 6*d.* to 62*s.* 18 bags good St. Lucia realised 57*s.* to 58*s.* 100 bags Dominica sold at a slight advance at 59*s.* for fine red, and 53*s.* to 57*s.* for fair to good. 163 bags Jamaica were quitted at very full prices—50*s.* to 57*s.* for common to good. 40 bags good reddish Samana realised 55*s.* 7 bags Colombian partly sold at 58*s.* 333 bags Haiti sold at 43*s.* to 45*s.* Of 511 bags Guayaquil offered, 390 bags sold—good Machala at 68*s.* 6*d.* Of 136 bags African only 18 bags good red sold at 57*s.* Ceylon was in fair request, 1,200 bags selling out of the 3,106 bags brought forward, but prices were irregular, the best grades appreciating 1*s.* per cwt., whilst other qualities were only steady, fine bold and medium red brought 74*s.*, fair to good ditto 66*s.* 6*d.* to 68*s.*, ordinary medium and small 57*s.* to 61*s.* 6*d.*, common to fair small 43*s.* to 52*s.*, and collected 52*s.* to 53*s.* per cwt. Privately 100 bags Trinidad and 300 bags Ceylon sold at auction rates.

Pepper.—Black, the market is very quiet, and for arrival the only sale reported is a little lot of 25 tons Singapore, June-August shipment (s.) at $5\frac{5}{8}d.$ On the spot, sales of fair Singapore have been made at $5\frac{11}{16}d.$ to $5\frac{19}{32}d.$

At public sale on Wednesday 48 bags Singapore bought in in at $5d.$ to $6d.$, 226 bags Penang at $5\frac{1}{2}d.$, and 101 bags Aleppy at $5\frac{3}{4}d.$ 200 bags Malabar sold—fine bold heavy brown $5\frac{1}{2}d.$ to $5\frac{5}{8}d.$, good ditto $5\frac{3}{8}d.$ to $5\frac{1}{2}d.$, good heavy shot small, Aleppy character $5\frac{1}{4}d.$ per lb. 1 bag Ceylon, good brown, sold at $5\frac{1}{4}d.$ per lb. White is dull and easier. Sales of fair Singapore at $9\frac{13}{16}d.$, fair Siam at $9\frac{3}{8}d.$ and fair Penang at $9d.$ For arrival no business reported.

At auction on the 28th instant of 214 bags Singapore catalogued 22 bags "Gabis" sold—good bold $10\frac{1}{2}d.$, mixed shrivelled $9d.$, common shrivelled $5\frac{3}{4}d.$ per lb. 138 bags Siam retired at $9\frac{3}{8}d.$ to $9\frac{1}{2}d.$ Of 237 bags Penang 160 bags sold (mostly without reserve), ordinary to fair limed $8\frac{7}{8}d.$ to $9d.$ per lb. 32 bags Ceylon taken out.

Ginger.—Cochin, we are still unable to report any improvement in the demand for this article, and of the 21 cases 758 bags offered only 20 bags fair medium and small washed rough sold at 39*s.* per cwt. Bold cut bought in at 80*s.* to 95*s.*, medium at 65*s.* to 75*s.*, small at 55*s.* and cuttings at 37*s.* 6*d.* per cwt.

Japan—93 bags fair medium and small limed bought in at 35*s.* per cwt.

Jamaica.—Buyers views of value did not come up to those of sellers, and, as a consequence, barely 100 barrels sold out of the 721 barrels brought forward. Middling washed sold at 47*s.*, common to ordinary at 37*s.* 6*d.* to 40*s.* and Rhatoon at 34*s.* 6*d.* to 36*s.* 6*d.* per cwt. or 1*s.* below valuations.

Cardamoms.—The tone was distinctly better than of late, and prices showed an advance of 1*d* in some instances, while decorticated seed was 1*d.* to 2*d.* dearer. The following prices were paid:—Ceylon-Mysores, good medium sized pale, bright smoth 2*s.* 1*d.* to 2*s.* 2*d* ; medium and bold pale long, 1*s.* 8*d.*; small and medium bright pale 1*s.* 6*d.*, small and medium pale 1*s.* 2*d.* to 1*s.* 4*d.*, very small pale 1*s.* to 1*s.* 1*d.*; brown and split 1*s.* to 1*s.* 1*d.* Ceylon-Malabar, light shelly pale, 10*d.* to 11*d.*, bold and medium pale were held at 2*s.* per lb. Decorticated seed sold at from 1*s.* 6*d.* to 1*s.* 9*d.* per lb. Several parcels of Cardamoms were held at high limits, and were not pressed for sale.

India Rubber.—With continued pressure to sell spot and near delivery prices have again declined. Receipts large, about 2,000 tons this month, increasing the visible supply. A large business has been done here, spot and for delivery up to August-September, hard fine spot down to 2*s.* $11\frac{1}{2}d.$, entrefine 2*s.* 10*d.*, forward delivery higher. Negroheads easier, $\frac{1}{4}d.$ to $\frac{1}{2}d.$ per lb. lower; Cameta at 2*s.* 1*d.* per lb. Peruvian ball sold, fair spot and afloat at 2*s.* $4\frac{1}{4}d.$, slab neglected.

Coffee.—Supplies at auction during the week have been of moderate extent, and with a continued good demand the bulk has been disposed of at prices favouring sellers. A few lots of Ceylon realised extreme rates. The limited past, and the sales made show an advance of 2*s.* to 3*s.* per cwt. Jamaica was in strong request at an improvement of 3*s.* per cwt. since the last auctions, while Costa Rica and other Central American descriptions close with firmness at about 2*s.* per cwt. above the prices of last week. The market for "futures" has shown a few fluctuations, and though closing rates exhibit no material change since our last report, the tendency is downward, yesterday Santos for September delivery sold at 30*s.* 4½*d.* to 30*s.* 6*d.*, December at 31*s.* 3*d.*, March at 32*s.* and May at 32*s.* 6*d.* per cwt. To-day auctions offered 500 bags East India, 343 bags Mexican, 467 bags Costa Rica, 242 bags Columbian, 52 bags Jamaica, 333 bags Nicaragua, 147 bags Guatemala, 722 bags Vera Paz and 100 bags Cuban. No alteration in values, demand fair.

Brazil futures steady and quoted as follows:—March 32*s.* 3*d.* sellers, 32*s.* buyers; May 32*s.* 9*d.* sellers, 32*s.* 6*d.* buyers; July 30*s.* 3*a.* sellers, 29*s.* 9*d.* buyers; September 30*s.* 7½*d.* sellers, 30*s.* 4½*d.* buyers; December 31*s.* 6*d.* sellers, 31*s.* 3*d.* buyers.

Per Mail Advices of May 30th, 1902.

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th June, 1902.

Wired at 4.10 p.m. on 16. 6. 02.

To England:			Tons Steamer.
Tin	from Singapore & Penang to England - and U. K. optional any ports		1,200
Gambier	from Singapore	to London -	...
„	„ „	to Liverpool-	320
„	„ „	to U. K. &/or Continent -	300
„	„ „	to Glasgow -	...
Cube Gambier	„ „	to England -	10
White Pepper	„	to „ -	20
Black Pepper	„ „	to „ -	20
White Pepper	„ Penang	to „ -	...
Black Pepper	„ „	to „ -	130
Pearl Sago	„ Singapore	to „ -	30
Sago Flour	„ „	to London -	550
„	„ „	to Liverpool -	1,075
„	„ „	to Glasgow -	...
Tapioca, Flake	„ S'pore & P'nang	to England -	360
„ Pearl & Bullets	„ „	to „ -	310
„ Flour	from Penang	to „ -	580

			Tons Steamer.
Gutta Percha	from Singapore to England	- -	100
Pineapples	„ „ to „	- cases	16,500
To America:			
Gambier	„ „	- -	2,000
Cube Gambier	„ „	- -	20
Black Pepper	„ „	- -	560
„	„ Penang	- -	130
White Pepper	„ Singapore	- -	40
„	„ Penang	- -	...
Nutmegs	„ Singapore and Penang	- -	25
Tapioca, Flake and Pearl	„ „ „	- -	15,000
Pineapples	„ „	- cases	8,000
To the Continent:			
Gambier	from Singapore to South Continental Ports		20
„	„ „ „ North „		20
Black Pepper	„ „ „ South „		90
„	„ „ „ North „		40
„	„ Penang „ South „		...
„	„ „ „ North „		...
White Pepper	„ Singapore „ South „		10
„	„ „ „ North „		20
„	„ Penang „ South „		...
„	„ „ „ North „		...
Copra	„ Singapore & Penang to Marseilles		1,250
„	„ „ „ Odessa		...
„	„ „ „ South Continental Ports (other than Marseilles and Odessa.)		640
„	„ „ „ North Continental Ports		220
Tapioca Flake	„ „ „ Continent		210
Tapioca Pearl	„ „ „ „		210
Cube Gambier	„ Singapore to Continent		40
Pineapples	„ „ „ „	cases	1,750

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

750 tons Gambier
140 „ Black Pepper (*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, Fenchurch Street, London. E. C.

Singapore.

Abstract of Meteorological Readings for June, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·871	140·3	81·4	87·9	73·7	14·2	78·4	·894	76·4	77	S. E.	5·66	1·46

K. K. Hospital Observatory,
Singapore, 21st July, 1902

A. B. LEICESTER,
Meteorological Observer.

T. S. KERR,
Principal Civil Medical Officer, S.S

Penang.

Abstract of Meteorological Readings for June, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·888	152·1	80·4	89·5	74·3	15·2	75·8	·801	71·4	72	S.	7·78	3·68

Colonial Secretary's Office,
Penang, 9th July, 1902.

G. D. FREER,
Acting Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for June, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Greatest Rainfall during 24 hours.	Total Rainfall.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
General Hospital.	29·825	153·2	83·1	89·8	70·	19·8	81·6	1·062	61·3	94	E.	8·14	5·10

Colonial Surgeon's Office,
Malacca, 16th July, 1902.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for June, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet.	Vapour Tension.	Humidity.		
Taiping ...	154	83·29	94	71	23	78·08	·893	78	5·60	1·18
Kuala Kangsar ...	...	81·02	92	70	22	76·82	·865	82	4·68	1·80
Batu Gajah ...	156	81·41	92	71	21	77·02	·871	82	6·53	2·27
Gopeng ...	...	80·84	91	65	26	77·38	·894	85	11·48	2·60
Ipoh ...	...	81·19	92	70	22	77·17	·880	83	8·02	1·08
Kampar ...	...	...	91	69	22	...	...	...	10·17	4·62
Teluk Anson ...	...	81·46	92	70	22	77·46	·890	83	7·68	2·00
Tapah ...	..	80·98	92	69	23	76·83	·867	83	10·41	1·85
Parit Buntar ...	...	83·08	93	72	21	78·03	·993	79	4·50	1·85
Bagan Serai ...	...	82·58	91	71	20	77·94	·897	81	4·53	3·30
Selama ...	...	82·29	91	71	20	77·85	·893	81	7·56	3·35

STATE SURGEON'S OFFICE,
Taiping, 11th July, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for June, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·877	150·7	81·0	90·5	71·4	19·1	76·9	·843	74·1	76	Calm	4·55	2.26
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	4·33	1.56
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	6·99	3.02
,, Klang	...	...	...	85·5	74·5	11·0	...	...	...	...	...	5·57	1.53
,, Kuala Langat	...	...	...	85·8	73·3	12·5	...	...	...	...	...	5·10	2.00
,, Kajang	...	...	...	85·9	75·7	10.2	...	...	...	...	...	4·11	1.00
,, Kuala Selangor	...	...	...	86·2	76·4	9·8	...	...	...	...	...	2·56	1.02
,, Kuala Kubu	...	...	...	92 4	72·3	20·1	...	...	...	...	...	7·50	1.20
,, Serendah	...	...	...	88·4	75·9	12·5	...	...	...	...	...	10·57	2.15
,, Rawang	...	...	...	86·1	73·9	12·2	...	...	...	...	...	6·83	1.60
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	1·22	0.38

State Surgeon's Office,
Kuala Lumpur, 11th July, 1902.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for June, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, District H'pital	...	...	...	93·	72·	13·9	...	...	...	...	...	7·15	2.45
Kuala Lipis - -	...	...	82·7	95·5	70·0	24·0	...	...	...	...	...	9·49	2·04
Raub - - -	...	...	81·6	94·0	71·0	18·63	...	...	...	...	...	4·63	1·04
Bentong - - -	...	...	79·2	92·0	66·5	25·5	...	...	...	...	...	1·18	·22
Kuantan - - -	...	...	...	...	...	...	...	...	...	...	...	...	...
Temerloh - - -	...	...	...	94·	74·	20·	...	...	...	...	...	2·80	1·22

Pahang, 2nd July, 1902.

D. H. McCLOSKY,
District Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for June, 1902.

District.	Mean Barometical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	84·	96·	70·	16·	74·	...	...	...	S. W.	5·21	1·30

Muar, 1st July, 1902.

FRANCIS PEARS.

No. 11.] SEPTEMBER, 1902. [Vol. 1.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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SINGAPORE:
Printed at the Government Printing Office.

NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 11.] SEPTEMBER, 1902. [VOL. 1.

FRUITS OF THE MALAY PENINSULA,—*Continued.*

MELIACEÆ.

The best local fruits of this order are the Sentol and Kechapi, (*Sandoricum*) and the Duku and Langsat (*Lansium*).

The Sentol, *Sandoricum indicum,* is a big though not often a lofty tree, with small creamy white flowers and large round yellow fruit enclosing several seeds wrapped in a rather scanty sweet white pulp. The tree is common all over the cultivated country, and often to be seen along roadsides. It fruits in July.

The fruit is rather poor and seldom used except by natives, but it is said to make a very delicate jelly when boiled down.

The Kechapi, *Sandoricum radiatum,* King, differs from the Sentol in its more pubescent leaves and botanically by stigmas being united and radiating with recurved points whereas in the Sentol the stigmas are quite free.

The fruit resembles that of the Sentol but is more acid, and with less pulp. It is wild in the Peninsula and attains a great size in the forests. It is considered an inferior fruit by the natives on account of its acidity.

The Langsat, *Lansium domesticum,* Jack, is a moderate sized tree with light coloured bark. The leaves are rather large with broad leaflets, slightly pubescent on the backs. The flowers are borne on the old wood and branches in small racemes. They are small and yellow. The fruit is about 1½ inch long elliptic or globose, with a thin buff coloured rind, enclosing two or three thin green seeds with clear white sweet pulp. The rind contains a certain quantity of white latex. The tree appears to be a native of the Peninsula as I have met with it in forests in Malacca, Selangor and elsewhere, and it is also much cultivated especially in Malacca. The fruit is ripe in July and August.

The Duku, differs in the thicker rind of the fruit, quite free from the sticky latex. The pulp is sweeter and the fruit on the whole rather smaller. It appears usually to fruit earlier in the year. It is abundant in Malacca and is cultivated elsewhere. A good quantity of Dukus are regularly imported from Java into Singapore. The Javanese strain being a very good one and the fruit cheap.

These trees are grown from seed and are of rather slow growth. They prefer good low lying but not too damp soil, stiff clay does not suit them at all.

OLACINEÆ.

The orange drupe of the Bidara Laut, *Ximenia Americana,* a sea shore shrub is eaten by natives, but is poor.

CELASTRINEÆ.

Salacia grandiflora, Kurz, "Nasi Sejuk" is a half scandent shrub with dark green leaves and small pearly flowers, the fruit is about 2 inches through with a rather thick orange coloured rind and a number of seeds enclosed in a sweet pulp after the manner of a Mangosteen. It is widely scattered over the Peninsula, but apparently does not fruit much. Plants which have been a good number of years in the Botanic Gardens have only lately flowered and fruited.

RHAMNEÆ.

Zizyphus Jujuba. The Jujube is cultivated here and there in the Peninsula. It is a thorny shrub or small tree with small ovate leaves yellowish beneath, little green flowers and globose or ovoid orange yellow fruits. It seems to prefer hot and dry sandy spots. It fruits well in Malacca, but a tree for many years in the Singapore Botanic Gardens has never yet produced fruits.

Z. calophylla. Wall. Akar Dawai-dawai, a common thorny climber, in the edges of forests, produces often an abundance of small drupes, orange coloured with a small stone covered with a sweet pleasant pulp. It is quite worth eating, though too straggling and irregular a plant to be worth cultivating. There is also but little pulp on the seeds, and the Malays say the proper way to eat it is to swallow seed and all.

AMPELIDEÆ

The Grape vine, *Vitis vinifera,* has been successfully cultivated in Singapore, and produced fruit, but the climate of the Straits does not appear to suit it really well. In fact it may be said to be destinctly not a plant for the tropics. The grapes which I have eaten in the tropics (Brazil) were small and green of the kind commonly known as sweet water grapes and rather poor and acid. The plant does not seem to like our heavy rains and thrives best in dry weather.

Vitis Marteni. The Saigon vine has long been cultivated at the Botanic Gardens where it fruits heavily every year. The bunches of grapes are very dense so that the little black grapes are not much longer than a large sized black currant. Probably if thinned out with a pair of grape scissors as is usual with grapes cultivated in Europe they might attain a larger size. They are sweet and juicy, but leave a slight trace of the irritation on the tongue after eating which is so characteristic of our wild grapes. It is probably due to the presence of raphides or minute spicules of silica.

It is readily grown from seed or cuttings. The plant though

long ago distributed over the tropical gardens of the colonies seems never to have been popular, although when first introduced there was a suggestion that it might eventually be used for making wine.

V. polythyrsa, Miq. Is rather a handsome climber with good sized clusters of quite large grapes, purple black and quite eatable but the pulp of the fruit is rather firm and it is less juicy than that of the English grape. It has barely a trace of the irritating spicules. I have met with it in Pahang and Perak, bearing clusters 6 inches long and more, but a plant cultivated in the Botanic Gardens though growing freely over the trellis, flowers but little and produces very few grapes.

It is raised from seed, and grown on a bamboo trellis.

Another wild grape with yellow fruit as large as a cherry, and quite eatable is *Vitis Lawsoni*. It is a powerful climber with very short corymbs of flowers so that the clusters are very small.

SAPINDACEÆ.

This order contains the genus *Nephelium*, which includes the well known fruits Rambutan, Pulasan and Litchi.

The Rambutan, *Nephelium lappaceum*, is a medium sized tree with large panicles of small green flowers, sometimes uninsexual so that one often finds trees which never produce any fruit, the flowers being male. It flowers in May and fruiting in August. The fruit is produced often in enormous abundance so heavily do the trees crop that on some years the supply is far in excess of the demand and much fruit is wasted.

There are a considerable number of varieties of the fruits. The most conspicuous differences being in the two colourings yellow or crimson. The yellow varieties seem to me inferior to the red ones as much in taste as in beauty. A red rambutan tree in fruit, is probably the most beautiful fruit tree in the World. There is a great difference also in the flavour, the fruit of some trees being acid, while others are quite sweet and delicately flavoured, and again in the amount of flesh on the stone. In some forms the flesh easily comes off, while in others it is difficult to separate it.

The fruit is usually eaten raw but is excellent when stewed, either as pie or with cream or it can be made into preserves, an oil is extracted from the seeds.

The Pulassan (*Nephelium chryseum*, Bl.) is a similar tree to the Rambutan, but the leaves are grey beneath. As a rule, it is a somewhat smaller tree, with rough bark. The flowers resemble those of the Rambutan, and as in that species uninsexual trees are not rarely to be met with.

The fruit is larger than the Rambutan and covered with short thick blunt processes instead of that long hairlike processes of the Rambutan. It is of a deep purple brown, the rind is much thicker and the flesh more abundant and firmer. The flavour is decidedly superior to that of the Rambutan. It does not vary as much as the latter fruit, and chiefly in the way in which the flesh clings to the stone. In some fruits the flesh is easily detached

while in others it is more closely adherent after the manner of ordinary Rambutans.

The tree will grow in much the same localities as the Rambutan, and takes about as long to develop. It flowers and fruits about a month earlier than the latter tree.

The Pulasan is much less known to the ordinary resident than the Rambutan. It is not so commonly cultivated, probably on account of the smaller demand for it.

HAASKARL describes three varieties, Pulasan burrum, a red form; P. hidung, a deep black red one, and P. bodas, yellow or orange. The two first forms are common here.

The Mata Kuching, *N. Longana* is a handsome tree with dark green leaves larger than those of the preceding. The fruit produced in large bunches is globular ½ to ¾ inch through, brown and tesselated. It contains but little pulp and is altogether inferior to the preceding ones. In fact Europeans seldom eat it, though it is highly popular with natives.

The Ridan, *N. glabrum*, is a wild species with roughened fruit of a deep red colour, oblong in shape, about an inch long. The fruit is produced in large bunches. It is not cultivated but eaten by natives when met with. The pulp is very acid.

The Litchi, *N. Litchi.* A native of China and by far the finest flavoured of all the Nepheliums, has often been cultivated in the Straits, and there are some remarkably fine trees in the Gardens in Singapore, but it has never fruited nor even flowered at least in the low country.

The Nepheliums are often attacked by small chafers, which devour the leaves sometimes almost stripping the trees.

The fruit is also liable to be devoured by fruit-bats, especially the smaller kinds. The natives defend their trees by tying on to the branches the thorny whips of rattans, so that the bats in attempting to attack the fruits get their wings torn by the thorns of the rattans and fall helplessly to the ground.

I have several times seen Rambutan trees attacked by a fungus which appears to enter by a wound, and canker the tree eating quite into the trunk. It is probably a species of Polyporus.

Xerospermum muricatum, Radlk. The Rambutan Pachat, is a tree with dark green leaves and yellow sharply muricate fruits, with a small amount of pulp on the stone which is sweet and pleasant to the taste. It is eaten by natives but not cultivated though it is quite as good as the Mata-Kuching. It and two other equally good species *X. loevigatum* and *X. Wallichii* are not rare in the forests of the Peninsula.

Erioglossum edule, Bl. Mertajam, is a fine tree common all over the Peninsula, with white flowers and small black drupes. As its scientific name denotes it is edible, but no one except children would ever eat it.

Melicocca bijuga. A native of South America, has long been in cultivation in the Botanic Gardens and often fruits. It is known as

the Honey berry, and certainly has a sweet taste, but is too small to be worth eating.

ANACARDIACEÆ

This order contains the Mangos, and a few other eatable fruits.

The common Mango, *Mangifera indica*, is often cultivated here and occurs in almost every village, but for a variety of reasons the fruit when produced is almost uneatable. The tree is a native of India and it is probable that the wetness of our climate does not suit it at all. The best Mangoes imported into the straits are those of Siam and the Philippines, but fairly good Mangoes are grown in Malacca.

In the Peninsula the tree is attacked by a large variety of insect pests, the worst of which is a boring caterpillar, which burrows up the stem of young trees and the branches and destroys them. The perfect insect is a large moth, but it has not yet been identified.

Another caterpillar attacks the leaves covering them with a web full of debris of leaves and frass.

The Mango weevil, *Cryptorhynchus Mangiferæ*, which bores into the fruit and destroys it also occurs in Singapore and is often seen too in imported Mangos. Notwithstanding all these pests Mango trees of large size may be seen in various parts of the Peninsula, but I have never seen really good fruit on them.

For those who wish to grow Mangos, it is better to isolate the trees from each other but to mix them with other trees allowing them top light but partly shading them with other trees, Mangos grown in the open and quite exposed, are generally killed by the borer as soon as they are big enough for it to attack.

There are a number of native Mangos, which are cultivated or half wild all over the Peninsula and which are more or less popular among the natives. Most of them are very large often gigantic trees with green fruit with a coarse flavour and firmer texture than that of the common Mango. The commonest of these is the Bachang, *M. foetida*, the fruit of which is dull green, and about as large as an ordinary Mango but less flattened. The flesh is firm and though sweet has an objectionable scent and flavour. It is eaten in curries, and also raw. Some varieties of it are quite palatable. It is grown from seed and is rather slow in growth, but will fruit when only twenty feet tall.

The Binjai, *M. cæsia*, is a remarkably handsome tree when covered with its masses of pinkish white flowers. The fruit somewhat resembles that of the Bachang but is longer and white. Its flesh is juicy but acid and white with an unpleasant odour. A variety Binjai manis with sweet juice and a light brown skin occurs in Singapore.

The Lanjut, *M. lagenifera*, is a very large tree with comparatively small leaves and a green fruit pear-shaped, 4 or 5 inches long. It is very fibrous and coarse flavoured and hardly even popular among natives.

The Kohini, *Mangifera odorata*, is a large tree with pink and

yellow flowers and foliage like that of the common Mango. The fruit is like a yellow Bachang but larger.

The Rumeniya, *Bouea burmanica*, Griff., is a large tree with small dark green leaves and a small orange mango. It is abundant in most villages. The fruit is popular with natives but is too acid to eat raw. It is good however stewed with plenty of sugar.

The Kundangan, *B. macrophylla*, has larger leaves and fruit, the latter as large as a hen's egg, is yellow with a thin skin, very juicy with a mango flavour. In appearance and texture it suggests a plum, and is really a good fruit. The tree fruits heavily and is very abundant in Malacca. Fruiting in July.

The Cashew-nut, *Anacardium occidentale*, though doubtless introduced from South America has established itself in many parts of the Peninsula especially along the sea coasts where sandy. It is a low much branched straggling tree with rather large leaves and pink flowers. The fruit has a pear-shaped swollen red peduncle on the top of which is the kidney-shaped fruit. The peduncle is very juicy and somewhat sweet, with an astringent after taste. It is rather a poor fruit on the whole, and the best way of using it is to squeeze the peduncle into a glass, and add some sugar so as to make a drink of it. The nut can be eaten raw or parched, requiring, however, the black skin of the kernel to be first removed. The fruit in the Straits is usually very small, and very inferior to the Cashew of South America.

The Hog plum, *Spondias dulcis*, a native of the Polynesian Islands has been cultivated successfully in the Straits, and there were formerly some good fruiting trees on the Chasseriau Estate in Singapore. The fruit is something like a small Mango. It is called Kadondong Jawa.

LEGUMINOSÆ.

Cynometra cauliflora. L. The Nam-nam is a low tree or shrub which produces brown oblong fleshy pods from knots on the lower part of the stem. They are two or three inches long, and about half an inch thick or larger. They are eaten raw by natives sometimes but are best stewed. The flavour is somewhat acid.

Dialium. The several special of Kranji produce small black fruit ovoid and flattened or globose. They contain a single seed, which is enclosed in a light brown pulp with a pleasant flavour. The trees are often of enormous size, and are never cultivated being of very slow growth but the fruits are collected and sold in the markets in considerable quantities.

The Tamarind, *Tamarindus indicus*, is probably a native of Africa, but has long been cultivated in India, being recorded thence from the earliest times. The tree is often to be seen in villages, but seems to grow best on the sea coast. It attains a good size, but seems here at least to be slow in fruiting. The fruit is much used by the Malays in curries, but Europeans here rarely use them. In the West Indies the pods are gathered when ripe, which is

known by the brittleness of the shell. The shells broken away and the contents of the pod placed in layers in a cask and boiling syrup poured over them, when cool they cask is closed and ready for export. Sometimes layers of sugar are placed between the layers of fruit. East Indian tamarinds are often merely shelled and pressed together without sugar.

Detarium senegalense. An African tree with an edible drupe and *Castanospemum australe.* The Australian Chestnut have both been in cultivation in Singapore for many years but have never fruited.

Parkia speciosa. Hassk. "Petai" is a very tall tree with feathery foliage and balls of yellowish flowers hanging on long peduncles, succeeded by thin green pods. They are not fit for Europeans as they have a very unpleasant odor which they transfer to the eater, but they are in much demand by Malays who pay a cent or more for a pod, and cook and eat them with curry.

The Jering fruit, *Pithecolobium lobatum,* is a very common tree, the seeds of which are boiled with wood ashes two or three times on successive days and eaten by Malays and are said to taste like chestnuts. They also have a nauseous odor which they transfer to the eater, and are also liable to produce various ailments. The tree is so common in and round villages and waste ground, that it is not worth planting even for Malays, but the Petai is comparatively scarce and as the Malays are prepared to give a good price for the crop, may be worth while planting, for sale or lease to them.

Gayam. *Inocarpus edulis,* the Otaheite Chestnut, is a small tree with large dark green shining leaves and yellow flowers. It produces an oblong flattened pod, containing a large flattened seed, This when boiled, the pod being previously split, tastes like a chestnut, and is quite worth eating. It is a native of Christmas Island and the Polynesian Islands. It grows well and fruits readily in Singapore.

H. N. RIDLEY.

FICUS ELASTICA.

The following papers on the cultivation of Ficus elastica will be read with some interest by planters. They were procured by Mr. A. B. LAKE, Honorary Secretary of the Negri Sembilan Planters' Association, and forwarded by the Resident-General of the Federated Malay States:

Land Records and Agriculture, Assam.

Form No. 118.

It is requested that any reply, or future reference, to this communicatiou may quote its number and date.

No. 1552.

From

B. C. ALLEN, ESQ., B. A., I. C. S.,

Officiating Director, Department of Land Records and Agriculture, Assam.

To

THE SECRETARY TO THE RESIDENT-GENERAL, F. M. S., SELANGOR, MALAY PENINSULA

Dated Shillong, the 7th June, 1902.

Sir:—With reference to your letter No. N. Sem. 2086/02, dated the 23rd April, 1902, with which you forwarded a copy of a letter dated the 11th March, 1902, from the Honorary Secretary of the Negri Sembilan Planters' Association, asking for information as to the growth and cultivation of the *Ficus Elastica*. I have the honour to forward copies of the papers noted in the margin: describing the method of tapping and the average yield of the rubber tree. The best time for tapping is immediately after the rains, and the best instruments to use are V shaped gouges which remove the bark without injuring the wood. The trees are allowed to throw out aerial roots at discretion and the branches are not lopped. The age at which tapping operations can most profitably be commenced is a matter which still requires determination, but most of the trees in the Government plantations are now between twenty and thirty years old.

(1)—Notes by Messrs. Mann & Copeland containing a brief account of how rubber trees are grown in Assam:

(2)—Letter No. 164*K*, dated the 22nd August, 1900, from the Conservator of Forests, Assam, to the Inspector-General of Forests to the Government of India containing a report on the tapping operations conducted in the Charduar plantation in 1899-1900.

I have the honour to be,

Sir,

Your most obedient servant,

B. C. ALLEN,

Officiating Director,

Department of Land Records and Agriculture, Assam.

Brief account of how Rubber trees (Ficus Elastica) are grown in Assam.

The seed ripens from January to March, when it is collected as it falls off the trees, and afterwards dried in the sun.

It is, properly speaking, the fruit, and consists of small figs, the size of a pea. These, at the time of sowing, are broken between the hands, and the seed thus mixed with the particles of the fruit, is sown without any attempt to clean or separate the seed. About 75 seeds are in one fig, and 90 figs go to one tola.

2. Germination takes place sometimes only three months after the seed has been sown, and as it is very small, it must be sown on the surface of the soil only, but otherwise, just like the seed of any other plants, it requires as much light as possible from above; sideshade is an advantage. The seed can be sown on beds, or in boxes, or flower pots but it is most essential that the drainage of the soil be perfect, and that the earth never becomes soaking wet, whilst, on the other hand, it should neither be allowed to become thoroughly dry, but be kept always moist.

3. As the seedlings are very small at first, they must be treated with great care, and drip from trees above the seed-bed must be guarded against. The soil must be kept loose and open. Vegetable mould is the best soil.

4. When the seedlings are 2-3 inches high, they have formed already a little thickened root, something like a small a carrot, and can then be transplanted very safely. This should be done on to a properly dug nursery-bed, *well drained*, and the seedlings should there be placed about one foot apart, in lines also a foot from each other.

5. After the seedlings have become 1-2 feet in height, they are very hardy, and can be transplanted at any time of the year; but as the deer are very much after the leaves of the rubber trees, and to avoid the great expense of fencing in a plantation, it is advisable to transplant the young trees a second time in nurseries, giving them more room, say 3-4 feet square each plant, and to let them grow until 10 to 12 feet high, when they can be put out into the plantation without fear that the deer will destroy them. They require, however, a strong stake each, as the deer will bend the young trees down with their horns, if not staked.

6. The seed of *Ficus elastica*, where the tree grows naturally in the forests, germinates almost invariably in the forks of trees, 30 to 40 feet and more above the surface of the ground, and the young trees grow in consequence for some 6 to 10 years as epiphytes, after which the aerial roots reach the ground and increase rapidly in size, until some of them reach a girth of from 4 to 6 feet. They are very numerous, and it is not uncommon at a later age that they are thrown out also from the upper branches 60 to 80 feet from the ground, being first as thin as whipcords, but very soon increasing in size after they have reached the ground. It thus frequently happens that the tree on which the young rubber seedling first germinated is killed by the more vigorous growing *Ficus*

elastica, which in this respect resembles the well-known Banyan tree, and is one of the largest growing trees of the mixed forest in Assam. It requires an exceedingly damp atmosphere to do well, and therefore thrives best at the foot of the mountains, or on the mountains themselves, up to an elevation of 2,000 feet. It is met with also at a higher elevation, but there it is not so vigorous and at 5,000 feet it is liable to be injured or killed by frost.

7. Seedlings of *Ficus elastica* planted in the forks of trees in the forest are very difficult to attend to, and they in consequence often become dry about their roots, which retards their growth if it does not kill them; for these reasons, rubber trees planted on the ground grow much better in the Assam plantations, and the latter mode of planting has therefore been adopted almost exclusively. They are not planted, however, on the ground in the common way, but on small mounds 3 to 4 feet high of earth, and the cut wood and rubbish close at hand, which suits the epiphytal habit of growth of this tree.

8. This Rubber tree can also be readily propagated from cuttings, if only perfectly ripe young branches or shoots are used, but young trees so raised are not so hardy as the seedlings, and do not make equally good growth in the first five to ten years.

9. To ensure the greatest possible amount of moisture in the atmosphere, the plantations of *Ficus elastica* in Assam have been made in the moist evergreen forests, near the foot of the hills, through which lines 40 feet in width were cleared 100 feet apart from centre to centre of the lines, thus leaving 60 feet of forest standing between the line. On these cleared lines the mounds for the planting of the seedlings or saplings are thrown up at distances of 25 feet apart. Care has to be taken afterwards to prevent the forest trees left standing closing in above, over the lines and the Rubber trees planted on them, which they have always a tendency to do, and which, if not guarded against, is very detrimental to the growth of the young Rubber trees. This is easily effected by lopping the branches of the forest trees left standing. The undergrowth which springs up on these lines, and as a rule, grows most vigorously, has also to be cleared two or three times in the year for the first four or five years to admit air for the young Rubber trees; but beyond this, and the putting occasionally some more earth on to the mounds on which the trees were planted, nothing is necessary.

10. The lines for the planting are cut in an east and west direction, so as to protect the young Rubber trees against the strong sun in the middle of the day; the atmosphere also keeps moister in this case than if the lines were cut south and north.

11. High ground is always best, and swampy ground, where water lodges, should be avoided; but the tree grows very well on alluvial flats, on the banks of rivers, even though the land be inundated for a few days once or twice in the year.

G. MANN,
Conservator of Forests, Assam

Brief account of how Rubber trees (Ficus elastica) are grown in Assam,

By D. P. Copeland,

Deputy Conservator of Forests, Darrang Division.

Ficus elastica.

1. The Indian rubber fig or Caoutchouc tree is indigenous to Assam where it is found a dominant tree in the evergreen forests. It requires an exceedingly damp atmosphere, and the best natural rubber trees are met with in the forests at the foot of the hills, or on the hills themselves up to an elevation of 2,500 feet.

Natural germination.

2. In its natural state, the rubber tree starts from seed dropped by birds in the forks of other trees, often 20 or 30 feet or even more from the ground, where it germinates, and the young plant remains an epiphyte for years until its aerial roots touch the ground; as soon as this takes place, the little epiphyte changes rapidly into a vigorous tree, throwing out numerous aerial roots which gradually envelope the tree on which it first began life and often kill it out.

Having started life so high up, it soon throws out branches which overtop the surrounding trees, and the numerous aerial roots, which fall from these and establish connection with the ground, in a few years enable it to dominate the forest growth around it.

Seed.

3. The seed of this tree is contained in fig-shaped fruit, about 75 seeds being found in one good sound fig. The fruit first begins to form on the trees in March and ripens from May onward to December. On some trees the whole crop ripens and falls off by June, but, as a rule, the rubber tree has fruit on it from April right up to December, the figs forming, ripening and falling off, the whole of the rains.

After collection the figs have to be carefully dried and mixed with pounded charcoal, which preserves the seed for several months.

Seed beds.

4. In the Charduar rubber plantation nursery, for a seed bed $40' \times 3\frac{1}{2}'$, two to three seers of pulverized rubber seed, 10 seers ash and 20 seers of vegetable loam or good soil, is well mixed in a half cask and spread evenly over the bed, and then lightly tamped down and watered. Such a bed should yield, with good germination, 2,000 seedlings and should be sufficient for putting out 100 acres of rubber planted $70' \times 35'$. The beds must be well-raised and drained, the soil being prepared in the same way as for vegetable or flower seed. If sown in boxes, these should be put under the eaves of a house; if in beds, light removable shades must be put up to keep off the direct rays of the sun. The shades should be removed during rainy or cloudy weather and at night.

Light sandy loam is most suitable for seed beds; if the soil is stiff, charcoal dust should be mixed with it to make it porous and prevent caking. The bed or boxes must never be allowed to get dry.

5. This should be done exactly in the same way as for vegetable or flower seed which requires transplanting after germination. The figs are broken between the hands. As the seed is very minute, the particles of the fruit are left with the seed and sown with it, no attempt being made to clean or separate the pulverized figs. In order to distribute these minute seeds evenly over the seed beds or boxes, a certain quantity of ash and soil is mixed with them.

Sowing.

6. Germination takes place from the end of April to the end of the rains. Seed sown between October and January requires daily watering and screening from the sun, and will not germinate before the end of April or the beginning of May, but seed sown any time during the rains will germinate in a few days (from five days to a fortnight). It follows that the best time for sowing seed is during the rains—that is from June to September.

Germination.

The embryo appears on the germination of the seed as a seedling having a pair of opposite cotyledons with an entire margin destitute of incisions or appendage of any kind, with the exception of the notched or emarginate apex, oval in general outline, green in colour and of a glassy smoothness. The second pair of leaves show a tendency to the alternate arrangement on the stem but appear at the same time. Their shape and venation are very different from those of the primary leaves, for they have a central midrib and a distinctly coarsely-crenated margin. The third pairs of leaves do not appear simultaneously, and are distinctly alternate, with a marked reddish colour: after this the plant is easily recognized.

7. When the seedlings are one to two inches high in the seed beds or boxes, they should be transplanted into nursery beds, and put out in lines about a foot from each other. The nursery beds should be well-raised and drained, but the soil need not be so carefully prepared as for the seed beds. Here the plants are kept till the following rains, when they are dug up and taken to stockaded nurseries in the forest, and put out $5' \times 5'$ on raised well-drained beds, where they remain for two years till they are required for planting operations.

Pricking out.

8. Almost every animal will eat the young rubber plants; it is, therefore, impossible to plant out small seedlings in the forest owing to the destruction by wild elephants and game unless each individual plant is carefully fenced in. As this is too costly, and the rubber after it is one to two feet in height is very hardy and can be transplanted, with ordinary care, at any time of the year (the best time in Assam is between May and July), the seedlings are kept in stockaded nurseries in the forest where planting operations are to take place, and remain there till they are 10 or 12 feet high, that is, about three years after germination, when they are dug out and the roots are cut back 18 inches right around the plant and planted on the mounds in the forests.

Forest nurseries.

9. In artifical planting it is found that the rubber grows best on mounds. Lines are cut through the forest 20 feet wide and 70 feet apart from centre to centre; in these lines 15 feet stakes are put up 35 feet apart. Round each stake a mound is thrown up four feet high. The base of the mound is about ten feet in diameter and they taper to four feet on the top; on this mound the rubber tree is planted, care being taken that the roots are carefully spread out before they are covered up with earth. To prevent animals pulling the plants and wind blowing them down, they are tied to the stakes.

Planting operations.

10. The rubber tree can readily be propagated from cuttings, if only perfectly ripe young branches or shoots are used, but the tree raised from cuttings does not appear to throw out aerial roots, and, as the future yield of the tree probably depends on its aerial root system, it is questionable whether trees raised from cuttings ought to be used except where required only as a shade giver, such as in an avenue. In the Charduar rubber plantation, propagation by cuttings was given up very early, that is about 1876, the plantation having been commenced in 1873.

Cuttings.

The best time to take cuttings is May and June.

11. The rubber grows equally well on high land or low land, in forest land or grass land, so long as it is planted on a mound and its roots are not exposed to the sun. It is a surface feeder, but, as soon as its roots appear above ground, they must be covered with fresh earth until such time as the tree has formed a sufficient leaf canopy to protect itself.

General.

Report on the results of Tapping operations in Charduar Rubber Plantation in 1899-1900.

No. 164K, dated Camp Dhubri, the 22nd August, 1900.

From—J. A. McKee, Esq., *Conservator of Forests*, Assam,

To—The Inspector-General of Forests to the Government of India (through the Secretary to the Chief Commissioner of Assam).

In continuation of correspondence resting with this Office No. 194K, dated the 3rd October, 1899, I have the honour to report the result of tapping compartments 3, 4, 5, 6, 7 and 8, etc., of the Charduar Rubber Plantation in the past season of 1899-1900.

2. An area of 474 acres, containing 6,810 trees, was worked over, yielding 4,502 lbs. of clean and dry rubber, as per detail below, and it should be noted that the trees in compartments 3 and 4 were tapped for the second year in succession, having been also operated on in 1898-99:

Area and outturn.

	Acres.	Trees.	Clean rubber yielded. lbs.
Compartment 3 - -	1·66	25	24
Ditto 4 - -	94·31	1,499	863
Ditto 5 - -	126·84	1,849	1,176
Ditto 6 - -	77·25	1,116	889
Ditto 7 - -	80·39	1,060	833
Ditto 8 - -	73·73	980	657
Road-side trees - -	20·00	281	60
Total - -	474·18	6,810	4,502

3. The above figures give an average outturn of 9·5 lbs. of clean rubber per acre and ·66 of a pound of clean rubber per tree. In the previous year, the figures of outturn were very similar, being 9·4 lbs. per acre and ·52 of a pound per tree, the outturn per tree being reduced by the Bomoni Hill plantation containing 8 acres, in which the trees are planted much more densely, and are, therefore, smaller than at Charduar—the actual density being 92 trees per acre in the former compared with only 14 per acre in the latter. It is, however, noteworthy that the Bomoni Hill area yielded 9·5 lbs. of clean rubber per acre, or about the same quantity as the average outturn for the whole area of 322 acres worked over in the season of 1898-99, a fact which tends to prove (the trees being of equal age) that a densely-planted area does not yield more rubber than one sparsely planted, while, on the other hand, it must have cost more to plant out originally and to establish as a going concern—see also remarks in paragraph 15.

Comparison with the previous season's outturn.

4. Compartments 3 and 4, which were tapped for the second season in succession, yielded practically the same outturn as in the previous year, the figures for compartment 4, containing 1,499 trees, being ·60 and ·58 of a pound of clean rubber per tree for the first and second year, respectively, while the few trees (25) tapped in compartment 3 this last season yielded ·96 of a pound per tree, as compared with ·70 of a pound per tree obtained from the entire compartment in the past year, the greater outturn this season being doubtless altogether due to the fact that the trees operated on were specially selected ones.

Outturn of trees tapped two seasons in succession.

5. Mr. Copeland, the Deputy Conservator of Forests, under whose careful personal superintendence and management all the operations were carried out, reports that tapping was commenced in the first week in December, or six weeks earlier than in 1898, the object being to escape the rain, which, however, does not seem to have been effective, rain having fallen off and on during the whole tapping period. It is also reported that three different tools were employed on the work, compartments 6, 7, and 8 being tapped by Nepalese and Assamese in the old and usual manner with *kukris* and *dhaos*,

Method of tapping—different tools used.

whereas compartments 3, 4, and 5 were tapped by Garos with half inch carpenters' gouges introduced for the first time as an experiment. The gouge was worked with a small mallet and is reported to be the best of the three methods, as it does not damage the tree so much as the *dhao* or *kukri*, shallow wounds, only bark deep, being made, instead of the deeply-incised and jangged wounds caused by the last-mentioned tools. In this connection, it is important to remember that the rubber cells are located in the inner bark layers, and that to obtain the *latex* flow, it is unnecessary to wound any portion of the cambium. It is therefore, expedient that the tapping tool employed should be capable of being controlled and guided to a greater extent than is practicable with a *dhao* or *kukri*, which can be used only with a forcible, and, oftener than not, a damaging cut.

6. The plantation was inspected by the Conservator as recently as the 13th of the present month, when it was observed that bark was already forming over the gouge cuts, that is to say, within eight months of the tapping operations, and it seems safe to predict that these kinds of wounds will be thoroughly healed twelve months after their first infliction. The *dhao* cuts, on the other hand, take longer to heal, and compartments 1 and 2 that were tapped in January, 1899, are only now recovering from the operation. Roughly speaking, it may be stated that these kinds of cuts take six months longer to heal than those made with the gouge.

Comparison of raw outturn obtained by different tools.

7. The outturn of raw unclean rubber obtained by the different methods was slightly in favour of the *dhao* and *kukri*, compartments 6, 7, and 8 yielding ·79 of a pound per tree, as compared with ·65 of a pound per tree yielded by compartments 3, 4, and 5. But the slight difference in favour of the *dhao* is more than counterbalanced by the greater damage caused to the trees, while it is reported by Mr. Copeland that the loss in weight caused by the extraction of foreign matters is in favour of the gouge—the actual ratio based on the results of carefully weighing the first two days' tappings being as 3 to 5. Unfortunately, the clean rubber obtained from the different compartments was subsequently not kept separate, when it became impossible to correctly differentiate between the clean outturn resulting from the use of the different tools, and the figures exhibited under this head in Statement *A* attached are considered to show results too favourable to compartments 6, 7, and 8, at the expense of compartments 3, 4, and 5.

New tool recently designed.

8. In this connection it may be noted that, with the help of Messrs. Ahmuty & Co., of Calcutta, a new kind of gouge has lately been made, which promises to turn out better for the work than either of those above mentioned.

Loss of weight by intermixture of foreign matters, etc.

9. Considering the figures relating to loss of weight, owing to cleaning and drying, as a whole, it would appear that, on the raw material as first collected, this loss came to about $5\frac{1}{2}$ per cent., a proportion

which compares favourably with the results of the previous year, when this form of wastage amounted to as much as 9 per cent., and which proves that some factor was present in the season's operations which tended to raise the quality of the raw outturn obtained.

Direction in which cuts should be made.

10. The cuts were made horizontal or only slightly oblique, it being noticed that the wounds bled in proportion to their horizontal direction, and that any considerable deviation from this direction resulted in a slower and reduced flow of rubber. Experiments on untapped trees were made personally by the Conservator with the view of testing this point, arrow shaped (the Brazilian method), oblique as well as horizontal

cuts being made, when it was very apparent that the latex flowed far more freely from the last kind than from either of the others. No examination of the bark or bast has yet been made to test the cause of this observed fact, which is not in agreement, it is believed, with experiments made elsewhere on rubber yielding trees and plants of other species. But an enquiry will be instituted with the help of Dr. Watts, the Government Economic Reporter, and the Director of the Forest School, with the view of obtaining information on the point. In the meantime, it seems safe to hazard the opinion that the rubber cells must be placed in more or less vertical rows, and that, in fact, in arrangement they resemble somewhat an arterial system, when it will be readily understood why a horizontal cut must be much more effective in tapping their contents than a vertical or oblique cut of equal length.

Rubber residuum and wastage discussed.

11. Another point was tested at the same time by the Conservator, which perhaps helped to create the opinion that the tapping operations, as performed in 1898-99, were of an unnecessarily careless or wasteful nature. Allusion is here made to the fact that, when the rubber is stripped from the cuts, a milky, and sometimes copious, residuum runs out of the wounds down the tree, and as no arrangement is made to collect this overflow, the impression may have been carried away that it represented wastage. But the Conservator was able to prove to his satisfaction that this residuum, which closely resembles rubber milk in appearance, contains no caoutchouc, and is capable of being practically absorbed by blotting paper or of being evaporated in the sun. In fact, it consists practically of little else than water and contributes no appreciable proportion of the true wastage, which seems to be wholly represented by that portion of the latex which spurts out of the wound during the actual process of tapping, and overflows on to the trunk or branches of the tree, or is sprinkled or drips on to leaves or under-

growth at its base. But all this apparent wastage is carefully collected and cleaned, and although it sells at a greatly reduced rate in the London market, the proportion it represents to the quantity of clean good material collected is not of any great importance. This last season, this particular kind of rubber amounted to 128 lbs. weight out of a total 4,502 lbs. of clean material obtained, or rather less than 4 per cent.; and it was sold separately in London at 1*s.* 6*d.* instead of 3*s.* 7*d.* per lb., which is equivalent to a gross loss (excluding charges) of Rs. 165 on a possible Rs. 10,844, or about $1\frac{1}{2}$ per cent.

Financial results on rubber sold in London.

12. The financial results of the operation were decidedly satisfactory as will be seen from the following figures :—

	£	*s.*	*d.*
4,323 lbs. of clean rubber (reduced in London to 4,280 lbs.) were sold at 3*s.* 7*d.* per lb. ...	766	16	8
128 lbs. of ground rubber (reduced in London to 122 lbs.) were sold in London at 1*s.* 10*d.* per lb.	11	3	8
Add—Interest 7 days on £201-5-0	0	3	10
Total receipts	778	4	2
Deduct—London charges, including freight from Calcutta	59	17	11
	718	6	1
	Rs.	*A.*	*P.*
Equivalent at exchange of day	10,732	12	3
Deduct—Calcutta charges	52	15	9
	10,679	12	6
Deduct—for plantation charges, tapping, cleaning, packing, freight to Calcutta, etc. ...	3,839	2	0
Net profit	6,840	10	6

A net profit, therefore, after deducting all charges, of Rs. 6,840-10-6 was realised on the 4,451 lbs. of good and inferior rubber despatched to England from the plantation, which is equivalent to Rs. 122-15-3 per maund of 80 lbs, or Rs. 1-8-7 per lb., as compared with Re. 1-2-3 per lb., realised last year.

Other rubber.

13. Besides the above rubber sent to England for sale, a balance of 51 lbs. was disposed of in the following manner which will make up the total 4,502 lbs. obtained from

the season's tapping operations, see paragraph 2:

Sent to Reporter on Economic Products, Calcutta ...	10 lbs.
Sent to Agricultural Chemist, Dehra Dun	2 ,,
Sent to Curator, Government Garden, Nilgiris ...	$\frac{1}{2}$,,
Sent to Ranger, Venkatramana, Forest Department, Madras	1 ,,
Sold locally for Rs. 51-8-0	$35\frac{1}{2}$,,
Kept as sample in stock	2 ,,
	51 ,,

14. Full details of all figures discussed above will be found in Statement *A* attached to this report, and in this connection it only seems necessary to draw attention to two more points, *viz.*, the reduced expenditure effected on tapping operations and the favourable report of the London broker on the quality of the rubber forwarded for sale. In regard to the first point, it should be noted that, in the previous season, an item of Rs. 1,198 was incurred on the purchase of coal tar for smearing over the wounds caused by the *kukris* and *dhaos*, partly as a healing application, but chiefly as a preventive or check on illicit tapping that might subsequently be made on the trees that had been worked over departmentally. This last season no expenditure has been incurred under this head, as it seems doubtful that the application of tar is of any utility, and the danger of illicit tapping is not considered sufficiently great to justify the considerable expenditure above mentioned. By eliminating this part of the original procedure, and by reducing the actual expense of tapping, the cost on the material landed in Calcutta was reduced from Rs. 94 to Rs. 70 per maund of 80 lbs. the actual figures being as follows:

Tapping charges and broker's report on quality of rubber.

	Rs.
Cost of 3,363 lbs. of rubber obtained in 1898-99 ...	3,967
Cost of 4,502 lbs. of rubber obtained in 1899-1900 ...	3,839

With regard to the second point mentioned above, Messrs McLeod & Co., of Calcutta, through whose firm the rubber was despatched to London and sold, write as follows:

People who have examined our parcel inform us that it is the finest stuff ever seen here from Assam. Last year's shipment could scarcely be improved upon in matter of cleanness and condition, but this parcel is more presentable, the packing being better done.

Doubtless, the better packing in *acme* tea boxes lined with cloth, instead of despatching the product in bags, as was done in the previous season, had much to do with the better price paid, 3*s.* 7*d.* per lb. having been realised as against 3*s.* $4\frac{1}{4}$*d.* in 1899.

15. In the attached Statement *B* is given a detail of the girth and crown or spread measurements of 10 per cent. of the trees that were tapped last season. The results are interesting so far as they go, and tend to prove, as might be expected, that the outturn of rubber is in pro-

Supplementary experiments.

portion to the spread of the trees. Abstracted, the figures give the following results;

Number of compartments.	Total nmmber of trees measured.	Total girth measurements. Ft.	Total crown measurements. Maximum diameter. Ft.	Total yield of rubber of measured trees, in tolas.	Remarks.
1	2	3	4	5	6
					Spread per tree. Outturn per tree.
4	100	1,064′	6,416′	3,362	64′...33½ tolas = ·83 of a lb.
5	162	1,446′	9,844′	5,414	61 ...33½ „ = ·83 „
6	95	703	6,035′	3,896	63 ...41 „ = 1·00 „
7	96	649′	5,815′	3,769	61 ...39 „ = ·97 „
8	97	475′	4,487′	2,281	58 ...29½ „ = ·73 „

The girth measurements of the trees are so difficult of being made in a uniform manner, owing to air roots which form supplementary stems having a tendency to anastomose, that the figures under this head may be ignored; but if the figures relating to the average spread of trees in the different compartments are compared, and it is borne in mind that the trees in compartment 4 were tapped for the second year in succession, it seem that, as above stated, the largest outturn is obtained from the trees having the best and widest crowns.

16. Another interesting statement is that attached to this report as Appendix *C*, which shows the result of tapping 21 good selected trees in compartments 2 and 3 for three years in succession, 1896-97, 1897-98. and 1898-99. This experiment should have been commented on in last year's report, but seems to have escaped observation. Abstracted, the results were as follows:

Result of tapping trees 3 years in succession.

Number of trees.		Yield, in lbs. 1896-97.	1897-98.	1898-99.
21	... ...	46	48	9

and they seem to prove that, although the first two years' operations will yield nearly equal outturns—agreeing in this with the figures quoted in paragraph 3 for compartments as a whole,—there, then, in the third year, comes a terrible falling off of 75 per cent. And as the trees in question, for the most part, are specially good specimens, and, in fact, are the dominant trees in compartments 2 and 3, the experiment should warn us to be very careful in working over the plantation too frequently, in successive years, without giving the trees sufficient time for recuperating from their former

tappings. The figures also prove that the small quantity of rubber yielded per tree by our tappings must be considered the maximum that can safely be extracted from them at present. Mr. Home's estimate of 2 lbs. per tree made when forecasting the outturn of 1898-99 was evidently of too sanguine a nature for the compartments as a whole.

17. With the meagre information as yet at our disposal, it is not safe to arrange for work more than one year in advance. Next season, therefore, it is proposed to tap compartment 4 for the third year in succession, with the object of verifying, in a more decisive manner, the results obtained from the limited experiment mentioned in paragraph 16 and recorded in the attached Statement E. But should the results of tapping the first 100 trees of this compartment show conclusively that the outturn is much smaller than on previous occasions, the work in this area will at once be stopped. In addition, compartments 9, 10, and 11 of the Charduar plantation, containing 251 acres and 3,490 trees, and the eastern block of the Khulsi plantation, containing 88 acres and 2,400 trees, will be tapped for the first time. The Charduar trees will be 19 and 20 years old and those at Khulsi 23 years old, and it is expected that they will yield, at the rate of 9 lbs. per acre a total of 3,051 lbs. of clean rubber fit for despatch to London. Subsequent operations should be guided greatly by the result of tapping compartment 4 for the third year in succession. If the outturn is poor, it will, I think, prove that, in the present condition and age of the plantation, it is only less wrong to tap the trees two years than three years in succession, and the practice should be discontinued. As a tentative measure, under these circumstances, three years' rest should be allowed to each area after having being tapped over. On the other hand, if no bad results follow the retapping of No. 4, compartments 1, 2 and 3 that were last tapped in 1898-99, may be again operated on in 1901-1902, as well as compartment 4 for the fourth year in succession.

Future operations.

18. In conclusion, the following deductions have been made from the points brought out by the figures and observations discusssed in the above report. In some cases these observations still require more proof before they can be formulated as rules for the guidance of future operations; but it seems convenient and likely to be useful to attempt such deductions as a means of attaining steadily, is gradually, to a correct method of plantation management:

Conclusion.

(1) That in the present condition of the plantation, only about $9\frac{1}{2}$ lbs. of clean rubber per acre can be safely extracted from the trees at one tapping (see paragraph 16).

(2) That a densely-planted area does not necessarily yield more rubber per acre than an area of the same age in which the trees are relatively much fewer (see paragraph 3).

(3) That the outturn of a tree in rubber seems to be in proportion to its crown or lateral spread (see paragraph 15).

(4) That a carpenter's gouge or a modification of this tool is best adapted for tapping, as it does less damage to the trees than the *dhao* or *kukri*, and enables the rubber to be collected with a smaller intermixture of foreign matter and dirt (see paragraphs 5, 6, and 7).

(5) That only horizontal cuts should be made during the tapping process, as neither oblique nor vertical cuts yield the same quantity of rubber (see paragraph 10).

(6) That the expensive application of tar to the wounded trees is not justified by any commensurate result, and may be discontinued (see paragraph 14).

(7) That, so far as experiments have been made, there are grounds for believing that the trees cannot be tapped three years in succession without showing signs of exhaustion, and that if this is proved to be correct, it is also probably only less wrong to tap the trees two years in succession (see paragraph 16 and statement *C*).

(8) That neat and careful packing has an important effect on the selling price obtained for the rubber in the London market (see paragraph 14).

STATEMENTS.

A.

Statement shewing the results of the tapping of Rubber Trees in Compartments 4, 5, 6, 7, and 8 of the Chardua Rubber Plantation during 1899-1900.

Particulars.	Compartment No. 3.	Compartment No. 4.	Compartment No. 5.	Compartment No. 6.	Compartment No. 7.	Compartment No. 8.	Total.	Miscellaneous Dhekrigaon road-side tree etc.	Grand total.
1	2	3	4	5	6	7	8	9	10
Area, in acres ...	1·66	94·31	126·84	77·25	80·39	73·73	453·99	20	474·13
Number of trees tapped—									
(*a*) Trees previously untapped ...	...	...	1,625	979	962	805	4,371		
(*b*) Trees previously tapped ...	25	1,325	...	...	...	...	1,350	281	6,810
(*c*) Suppressed trees ...	...	174	224	137	98	175	808		
Total trees tapped ...	25	1,499	1,849	1,116	1,060	980	6,529	281	6,810
Outturn, in lbs., of rubber on collection—									
(*a*) From trees previously untapped ...	...	...	1,203	912	868	661	3,644		
(*b*) From trees previously tapped ...	25	892	...	...	...	...	917	64	4,760
(*c*) From suppressed trees ...	...	20	40	28	14	33	135		
Total outturn as weighed on collection ...	25	912	1,243	940	882	694	4,696	64	4,760
Average yield per tree, as per above weighments—									
(*a*) Per previously-untapped tree, in lbs. (approximate) ...	...	...	·74	·93	·90	·82	·83		
(*b*) Per previously-tapped tree, in lbs. (approximate) ...	1·00	·67	...	...	...	...	·68	·22	·69
(*c*) Per suppressed tree, in lbs. (approxmate)	...	·11	·18	·20	·14	·19	·16		
Outturn of rubber dried, cleaned, and re-weighed, lbs.	24	863	1,176	889	833	657	4,442	60	4,502
Loss by dryage and removal of impurities, lbs. ...	1	49	67	51	19	37	254	4	258
Yield of rubber dried, and cleaned, per acre, lbs. ...	14·4	9·1	9·2	11·5	10·4	8·9	9·8	3	9·50

Statement shewing the result of the tapping of Rubber Trees in Compartments 4, 5, 6, 7, and 8 of the Charduar Rubber Plantation during 1899-1900—Continued.

Particulars.	Compartment No. 3.	Compartment No. 4.	Compartment No. 5.	Compartment No. 6.	Compartment No. 7.	Compartment No. 8.	Total.	Miscellaneous Dhekri-gaon road-side tree, etc.	Grand total.
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Cost of tapping and collecting ...	9 4 9	249 8 9	453 7 0	222 0 6	219 3 0	173 4 6	1,326 12 6	26 14 0	1,353 10 6
Cost of cleaning ...	1 15 5	70 10 3	96 4 3	72 12 4	68 3 0	53 12 8	363 9 11	4 14 7	368 8 6
Total cost ...	11 4 2	320 3 0	549 11 3	294 12 10	287 6 0	227 1 2	1,690 6 5	31 12 7	1,722 3 0
Average cost per lb. of cleaned rubber ...	0 7 6	0 5 11	0 7 5	0 5 3	0 5 6	0 5 6	0 6 1	0 8 6	0 6 1

				Rs.	a.	p.
Packing, weighing and cost of Acme chests, etc.				78	7	7
Carriage from plantation to Tezpur				12	8	0
Steamer freight, Tezpur to Calcutta				159	9	0
Erection and repair of camp huts				243	14	0
Clearing jungle and making paths for inspection				909	4	0
Measuring girth and crown and labelling trees				420	5	5
Purchase of, and making, gouge				66	12	0
Miscellaneous				206	3	0
				2,116	13	0
Add—As per statement, cost of tapping and collection and cleaning of the rubber				1,722	3	0
Total				3,830	2	0
Add—On account of Agents' charges :—	£.	s.	d.			
Printing, advertising and sale expenses	0	2	6			
Freight	6	19	7			
Wharf charges	4	19	7			
Brokerage	3	17	9			
Fire insurance	0	15	6			
Postage and pettiee	0	7	6			
Agency and Superintendence, London and Calcutta ...	23	6	9			
	40	8	11	=640	5	2
Calcutta charges :—	Rs.	a.	p.			
Shipping	11	2	0			
Insurance	33	1	9			
Stamps and postage	8	12	0			
				25	15	9
Total				4,496	9	11
	£.	s.	d.			
Gross amount of sale of 4,323 lbs. of clean rubber (reduced in London to 4,280 lbs.) at 3*s.* 7*d.* per lb. ..	766	16	8			
Ditto ditto of 128 lbs. of ground rubber (reduced in London to 122 lbs.) at 1*s.* 10*d.* per lb. ...	11	3	8			
Add—Interest for 7 days on £201-5	0	3	10			
	778	4	2			
Deduct—Discount at 2½ per cent.	16	9	0			
	758	15	2	=11,387	1	5
Deduct—Total expenditure as above				4,496	6	11
Net profit on 4,451 lbs. of rubber				6,840	10	6
Ditto per lb.				1	8	7

B.

Statement showing Girth and Crown Diameter of 10 per cent. of Trees tapped during 1899-1900.

Compartment number.	Line number.	Coal tar number.	Lable number.	1899-1900. Girth.		Maximum Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
4	1	1	1	13	5	82	9	30	
		4	2	20	9	65	10	40	
		6	3	10	4	48	4	8	
		7	4	11	6	40	7	40	
		10	5	4	7	57	6	35	
4	2	28	6	13	0	69	0	20	
		14	7	7	1	60	7	48	
		9	8	12	8	80	1	60	
		5	9	9	1	61	9	30	
		2	10	8	3	45	5	9	
4	3	2	11	8	0	52	4	29	
		11	12	8	9	74	5	35	
		22	13	11	3	73	8	84	
		26	14	11	11	87	1	92	
		31	15	14	0	77	2	84	
4	4	34	16	11	1	77	5	60	
		31	17	13	4	66	4	24	
		15	18	7	11	56	6	22	
		11	19	7	10	61	6	40	
		1	20	12	7	60	5	32	
4	5	1	21	11	4	61	6	50	
		10	22	7	4	62	2	42	
		26	23	6	8	54	4	24	
		30	24	11	5	68	7	16	
		33	25	9	1	48	7	80	
4	6	31	26	12	1	73	3	40	
		26	27	9	1	74	0	20	
		24	28	6	1	60	6	8	
		14	29	8	6	50	10	42	
		5	30	7	9	50	2	41	
4	7	3	31	11	4	75	4	70	
		11	32	10	8	65	6	18	
		22	33	9	0	62	3	24	
		26	34	9	8	61	0	26	
		29	35	10	8	70	4	5	
4	8	28	36	11	9	72	4	21	
		26	37	10	2	73	4	40	
		14	38	9	7	72	9	60	
		6	39	7	4	65	1	20	
		1	40	13	2	83	8	30	
4	9	1	41	10	11	57	0	18	
		3	42	7	10	68	8	22	
		16	43	8	8	59	4	26	
		18	44	11	6	59	7	54	
		37	45	10	2	83	3	20	
4	10	40	46	11	3	52	11	36	
		37	47	5	10	47	0	8	
		30	48	10	11	60	5	17	
4	11	15	49	10	9	58	2	64	
		1	50	10	5	68	5	56	
		15	51	14	10	79	9	45	
		26	52	11	9	63	0	31	
Carried over ...	..	...	...	534	10	3,361	8	1,896	

B—*contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900				Yield, in tolas.	Remarks.
				Girth.		Maximum crown diameter.			
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
Brought forward.	...	...	...	534	10	3,361	8	1,896	
		...	53	6	7	44	2	6	
		32	54	8	7	66	0	24	
		37	55	10	2	68	0	24	
4	12	31	56	18	8	78	11	53	
		20	57	16	9	76	9	84	
		12	58	10	3	54	9	28	
		10	59	13	2	89	2	84	
		1	60	11	3	71	0	39	
4	13	3	61	9	2	53	6	54	
		25	62	20	4	62	0	40	
		31	63	11	3	64	4	32	
		35	64	10	6	67	7	48	
		38	65	14	0	62	6	26	
4	14	41	66	9	8	65	3	25	
		38	67	15	0	83	0	60	
		33	68	9	3	58	2	10	
		27	69	8	6	66	0	12	
		13	70	9	10	58	7	7	
4	15	11	71	9	7	52	5	13	
		21	72	14	5	67	2	20	
		25	73	17	10	66	0	44	
		28	74	11	2	52	6	13	
		32	75	15	2	66	5	20	
4	16	32	76	12	9	73	7	24	
		28	77	16	7	81	4	56	
		24	78	7	2	75	0	8	
		21	79	8	9	60	4	11	
		3	80	14	5	70	5	21	
4	17	3	81	9	1	40	10	8	
		6	82	8	9	46	0	14	
		14	83	10	0	76	3	20	
		18	84	12	0	73	0	12	
		28	85	10	8	59	4	44	
4	18	25	86	9	0	44	4	17	
		20	87	7	9	56	3	32	
		14	88	12	5	69	3	32	
		6	89	10	9	71	3	68	
		3	90	8	8	52	7	17	
4	19	2	91	12	6	71	8	34	
		16	92	6	6	73	9	4	
		20	93	11	3	61	6	48	
		29	94	9	0	66	5	124	
		34	95	9	7	75	5	24	
4	20	29	96	8	8	64	8	22	
		24	97	7	10	35	9	16	
		18	98	6	5	47	6	10	
		10	99	9	11	59	0	18	
		4	100	7	8	54	8	16	
Total ...	...	...	...	1,064	0	6,415	11	3,362	

B—*Contd.*

Compartment number.	Line number.	Coaltar number.	Label number.	1899-1900. Girth.		Crown diameter		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
5	1	5	1	10	0	69	2	28	
		16	2	11	3	70	11	16	
		27	3	40	7	77	6	46	
		38	4	11	0	72	4	12	
5	2	40	5	13	5	62	9	50	
		31	6	9	4	67	10	32	
		22	7	16	0	53	6	24	
		13	8	20	2	51	6	24	
		4	9	21	4	61	4	32	
5	3	5	10	13	2	40	3	8	
		10	11	15	1	65	5	36	
		27	12	11	2	54	6	7	
		38	13	14	0	52	5	39	
5	4	43	14	12	11	88	3	20	
		34	15	12	10	65	3	16	
		25	16	16	2	52	1	36	
		16	17	10	10	86	9	68	
		7	18	12	7	71	8	56	
5	5	5	19	8	11	76	7	28	
		15	20	7	5	46	5	18	
		25	21	9	5	52	4	16	
		35	22	10	8	57	1	12	
		45	23	15	8	60	5	13	
5	6	41	24	9	8	60	10	12	
		32	25	8	5	76	9	42	
		23	26	11	11	48	7	35	
		14	27	8	10	41	6	17	
		5	28	16	6	78	8	20	
5	7	3	29	8	6	69	7	14	
		12	30	12	1	65	8	38	
		21	31	10	9	51	7	10	
		30	32	10	6	64	5	18	
		39	33	20	1	67	9	28	
		48	34	18	8	78	4	11	
5	8	48	35	12	0	46	4	17	
		39	36	10	6	59	10	28	
		30	37	16	7	67	7	12	
		21	38	5	2	58	5	32	
		12	39	5	5	60	10	48	
		3	40	38	8	76	4	48	
5	9	5	41	11	1	78	0	16	
		14	42	9	10	83	3	32	
		23	43	18	10	90	9	46	
		32	44	12	7	45	7	40	
		41	45	12	6	72	0	28	
5	10	50	46	8	3	85	10	64	
		41	47	18	8	82	11	36	
		32	48	20	8	64	0	52	
		23	49	12	4	76	1	28	
		14	50	8	8	64	7	36	
5	11	5	51	13	10	62	11	32	
		4	52	6	7	62	2	32	
		14	53	6	6	50	10	7	
		24	54	14	8	88	1	44	
		34	55	11	0	58	7	18	
		44	56	10	3	92	4	88	
Carried over ...	...	...	...	744	5	3,687	2	1,666	

B—*Contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900. Girth		Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
Brought forward...	...	...	...	744	5	3,687	2	1,666	
5	12	44	57	10	10	91	8	36	
		34	58	17	0	53	6	16	
		30	59	5	3	69	5	18	
		25	60	5	8	69	9	52	
		3	61	6	2	44	9	14	
5	13	5	62	8	9	53	9	10	
		15	63	3	9	43	10	12	
		18	64	8	3	76	5	28	
		29	65	7	0	57	2	22	
		33	66	14	0	83	6	100	
5	14	40	67	6	4	58	5	42	
		30	68	7	6	74	9	40	
		24	69	11	0	69	8	44	
		22	70	9	2	64	10	20	
		6	71	6	2	48	0	5	
5	15	11	72	6	6	40	9	20	
		15	73	4	4	36	3	17	
		24	74	7	3	57	4	35	
		35	75	11	5	56	6	40	
5	16	26	76	6	8	43	0	32	
		15	77	8	1	47	10	15	
		11	78	5	3	43	3	19	
5	17	4	79	5	1	47	10	29	
		13	80	6	5	51	5	32	
		20	81	5	2	48	7	26	
		27	82	5	1	53	6	26	
5	18	38	83	8	6	73	4	70	
		34	84	7	9	67	11	22	
		30	85	5	8	58	0	50	
		6	86	4	10	57	4	10	
5	19	8	87	5	1	47	6	21	
		17	88	4	5	45	4	25	
		33	89	8	1	54	10	30	
		41	90	5	1	55	0	18	
		46	91	4	7	46	8	26	
5	20	45	92	6	0	43	5	6	
		42	93	7	1	56	9	60	
		33	94	6	10	51	10	28	
		12	95	4	9	37	7	25	
		4	96	5	3	38	11	28	
5	21	2	97	4	2	36	3	8	
		21	98	7	3	42	0	14	
		33	99	8	0	50	9	24	
		36	100	8	5	62	10	50	
		42	101	8	8	65	4	64	
5	22	29	102	6	4	64	5	30	
		14	103	5	11	53	0	28	
		7	104	9	0	59	1	58	
		5	105	5	5	58	2	26	
5	23	6	106	5	7	59	6	38	
		9	107	5	9	67	5	28	
		24	108	6	9	56	8	50	
		26	109	5	1	34	10	16	
		33	110	5	5	39	0	25	
5	24	39	111	5	1	63	6	11	
Carried over ...	...	...	...	1,123	3	6,720	0	3,305	

B—*Contd.*

Compartment number.	Line number	Coal tar number.	Label number.	1899-1900. Girth.		Crown diameter		Yield, in tolas.	Remarks
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
Brought forward ...	...	...	...	1,123	3	6,720	0	3,305	
		36	112	5	9	56	11	12	
		30	113	4	1	40	5	10	
		25	114	4	0	45	3	12	
		23	115	5	2	61	2	26	
		7	116	4	2	46	1	13	
5	26	5	117	5	0	50	9	17	
		6	118	6	6	57	1	18	
		24	119	5	8	57	0	30	
		29	120	9	0	55	2	35	
5	27	31	121	6	5	73	10	54	
		29	122	7	2	67	6	40	
		21	123	5	0	50	0	16	
		8	124	4	4	45	4	20	
5	28	18	125	4	10	52	4	8	
		24	126	4	0	38	6	10	
		31	127	7	7	51	5	28	
		39	128	4	11	46	11	20	
		41	129	6	7	50	9	16	
		48	130	6	10	56	10	22	
5	29	47	131	10	5	85	4	68	
		40	132	4	2	68	0	14	
		34	133	5	2	59	0	28	
		27	134	6	6	55	0	64	
		25	135	5	2	60	0	40	
5	30	7	136	8	8	87	0	120	
		16	137	4	8	47	0	10	
		33	138	6	7	52	0	48	
		35	139	6	9	66	0	40	
		41	140	4	9	43	0	25	
5	31	44	141	5	9	63	0	34	
		29	142	5	3	53	0	26	
		16	143	6	2	65	0	18	
		9	144	8	4	71	0	70	
		7	145	7	9	82	0	80	
5	32	9	146	6	2	64	0	14	
		11	147	9	3	67	0	120	
		15	148	9	3	81	0	124	
		36	149	5	2	69	0	10	
5	33	31	150	9	7	71	0	32	
		22	151	8	8	63	0	66	
		19	152	5	4	67	0	36	
		17	153	12	0	74	0	210	
5	34	7	154	6	8	69	0	38	
		20	155	9	5	59	0	45	
		25	156	8	0	47	0	17	
5	35	17	157	7	5	62	0	35	
		14	158	4	8	40	0	14	
5	36	8	159	8	5	99	0	130	
		13	160	13	4	84	0	20	
5	37	9	161	14	11	85	0	56	
5	38	7	162	11	6	63	0	50	
Total ...	...	...	...	1,476	1	9,843	7	5,414	

B—*Contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900. Girth.		Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
6	1	5	1	8	10	77	0	22	
		9	2	9	6	66	0	69	
		11	3	6	6	67	0	22	
6	2	18	4	10	6	56	0	80	
		9	5	8	1	53	0	13	
		4	6	7	7	62	0	54	
6	3	3	7	5	8	80	0	40	
		18	8	10	5	79	0	58	
		21	9	8	0	81	0	33	
6	4	16	10	8	11	97	0	84	
		12	11	8	7	84	0	20	
		3	12	10	7	78	0	38	
6	5	10	13	8	3	60	0	70	
		15	14	7	7	82	0	37	
		22	15	8	3	76	0	25	
6	6	27	16	6	9	56	0	25	
		10	17	7	6	61	0	44	
		7	18	6	6	68	0	42	
6	7	6	19	7	8	66	0	30	
		16	20	8	1	62	0	40	
		23	21	8	9	66	0	30	
6	8	14	22	8	2	81	0	30	
		12	23	12	1	36	0	120	
		2	24	11	1	36	0	120	
6	9	6	25	7	10	44	0	14	
		16	26	9	4	56	0	27	
		23	27	8	9	76	0	58	
6	10	24	28	7	9	59	0	45	
		17	29	10	5	87	0	27	
		9	30	8	6	86	0	36	
6	11	17	31	9	4	42	0	23	
		20	32	7	10	47	0	32	
6	12	22	33	6	1	60	0	56	
		14	34	10	2	75	0	44	
		3	35	12	0	100	0	47	
6	13	17	36	10	2	82	0	84	
		19	37	6	8	50	0	49	
6	14	21	38	7	8	85	0	53	
		13	39	11	2	80	0	66	
		8	40	7	7	87	0	26	
6	15	14	41	8	3	75	0	70	
		19	42	6	7	74	0	84	
		26	43	7	7	49	0	35	
6	16	22	44	7	3	47	0	104	
		15	45	8	4	74	0	48	
		5	46	6	3	57	0	38	
6	17	13	47	8	1	60	0	34	
		20	48	8	3	72	0	110	
6	18	20	49	7	6	78	0	68	
		14	50	4	8	44	0	24	
		9	51	6	8	63	0	34	
6	19	17	52	6	2	52	0	10	
		21	53	5	6	65	0	18	
Carried over ...	...	...	...	436	2	3,556	0	2,510	

B—*Contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900. Girth.		Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
Brought forward ...	...	...	...	436	2	3,556	0	2,510	
6	20	22	54	6	5	54	0	20	
		17	55	5	6	63	0	36	
		9	56	5	10	49	0	36	
6	21	12	57	6	0	55	0	80	
		18	58	5	9	66	0	28	
6	22	12	59	4	9	42	0	13	
		9	60	5	0	56	0	43	
		5	61	5	10	59	0	18	
6	23	4	62	6	0	55	0	36	
		11	63	5	0	71	0	23	
6	24	16	64	5	10	59	0	18	
		12	65	4	10	57	0	24	
		3	66	8	1	60	0	40	
6	26	10	67	5	1	45	0	13	
6	27	25	68	5	1	56	4	24	
		18	69	5	10	59	7	30	
		13	70	9	6	70	0	32	
6	28	0	71	6	5	58	9	30	
		17	72	5	0	59	4	40	
6	29	20	73	7	7	65	0	17	
		15	74	4	10	35	0	33	
		4	75	6	10	61	0	40	
6	30	11	76	6	6	51	0	23	
		13	77	4	2	63	4	6	
		18	78	5	8	58	6	36	
6	31	28	79	5	0	52	4	30	
		16	80	6	0	55	9	33	
		11	81	6	11	55	7	14	
6	32	2	82	6	6	64	0	38	
		12	83	6	9	51	0	40	
		15	84	5	8	55	0	25	
6	33	24	85	6	11	66	0	88	
		18	86	6	9	81	0	40	
		5	87	6	8	55	0	50	
6	34	6	88	5	3	54	0	24	
		9	89	8	2	70	0	30	
		20	90	5	0	69	0	42	
6	35	17	91	7	9	68	0	26	
		11	92	6	8	60	0	16	
6	36	4	93	7	2	57	0	60	
6	37	4	94	8	11	75	0	40	
6	38	4	95	13	5	62	0	51	
Total ...	...	...	...	703	0	6,035	6	3,896	

B—*Contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900. Girth.		Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
7	1	8	1	6	0	43	0	14	
		14	2	6	2	80	0	77	
		18	3	7	1	61	0	31	
7	2	11	4	7	4	53	0	50	
		7	5	7	5	69	0	108	
		3	6	5	2	55	0	30	
7	3	6	7	5	8	75	0	56	
		21	8	5	11	49	0	54	
		23	9	8	4	56	0	51	
		28	10	8	1	69	0	36	
7	4	21	11	11	1	84	0	56	
		15	12	7	7	60	0	30	
		8	13	9	5	68	0	32	
7	5	10	14	4	8	59	0	17	
		12	15	5	7	61	0	18	
		25	16	9	0	61	0	28	
7	6	29	17	5	9	59	0	28	
		26	18	5	9	44	0	24	
		17	19	5	3	55	0	24	
7	7	6	20	5	11	75	0	77	
		22	21	7	4	66	0	77	
		26	22	7	6	78	0	75	
7	8	22	23	7	9	45	0	30	
		7	24	11	4	95	0	80	
		4	25	8	6	56	0	46	
7	9	12	26	14	10	79	0	110	
		18	27	8	8	63	0	25	
		19	28	7	5	71	0	60	
7	10	20	29	5	10	53	0	50	
		9	30	8	7	75	0	22	
		4	31	9	4	82	0	44	
7	11	5	32	7	9	71	0	43	
		10	33	6	1	78	0	58	
		20	34	9	3	58	0	42	
7	12	14	35	9	0	74	0	28	
		12	36	7	10	68	0	63	
		7	37	8	9	71	0	24	
7	13	5	38	7	1	62	0	15	
		17	39	9	2	71	0	55	
		19	40	9	9	69	0	36	
7	14	16	41	10	4	63	0	24	
		13	42	10	4	78	0	38	
		8	43	7	11	56	0	24	
7	15	2	44	8	8	67	0	46	
		5	45	6	10	47	0	11	
		18	46	6	2	77	0	25	
7	16	16	47	14	7	72	0	36	
		11	48	4	0	63	0	25	
		6	49	9	2	68	0	68	
Carried over...	...	...	...	387	9	3,212	0	2,121	

B—*Contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900. Girth.		Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
Brought forward ...	...	...	...	387	9	3,212	0	2,121	
7	17	8	50	5	4	58	0	20	
		10	51	6	9	63	0	34	
		24	52	8	6	74	0	30	
7	18	27	53	5	7	56	0	19	
		21	54	11	2	81	0	70	
		6	55	5	2	54	0	18	
7	19	8	56	4	1	57	0	22	
		13	57	4	6	31	0	40	
		15	58	3	10	50	0	16	
7	20	20	59	5	9	67	0	115	
		16	60	5	0	42	0	16	
		9	61	3	4	34	0	13	
7	21	2	62	6	2	55	0	25	
7	22	14	63	3	10	42	0	16	
		3	64	5	0	59	0	60	
7	23	3	65	3	8	47	0	22	
		19	66	7	8	62	0	26	
7	24	8	67	6	7	40	0	25	
7	25	5	68	4	7	36	0	20	
		11	69	3	11	34	0	8	
7	26	20	70	4	7	39	0	14	
		12	71	4	9	48	0	6	
7	27	14	72	5	4	57	0	29	
		16	73	5	7	57	0	64	
		20	74	5	8	70	0	40	
7	28	26	75	4	9	63	0	51	
		22	76	6	10	88	0	63	
		18	77	5	1	60	0	58	
7	29	9	78	5	10	59	0	46	
		10	79	4	5	50	0	42	
		20	80	4	10	51	0	35	
7	30	14	81	4	6	46	0	21	
		8	82	5	2	46	0	33	
		6	83	5	0	48	0	21	
7	31	6	84	5	6	62	0	20	
		7	85	5	9	47	0	40	
		22	86	4	7	56	0	28	
7	32	9	87	4	3	42	0	16	
		8	88	6	0	50	0	47	
		1	89	5	7	61	0	44	
7	33	2	90	6	0	67	0	68	
		11	91	6	0	58	0	64	
		16	92	7	2	63	0	34	
7	34	16	93	9	3	96	0	57	
		15	94	5	5	50	0	24	
		7	95	6	7	57	0	28	
7	35	7	96	6	8	70	0	40	
Total ...	...	...	...	649	3	5,815	0	3,769	

B—*Contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900. Girth.		Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
8	1	4	1	5	0	48	0	8	
		6	2	5	6	61	0	24	
8	2	10	3	7	10	59	0	22	
		3	4	5	6	67	0	24	
8	3	3	5	4	3	42	0	10	
		...	6	3	9	55	0	18	Between trees 4 and 5.
8	4	9	7	9	4	87	0	118	
		5	8	5	6	79	0	24	
8	5	17	9	6	6	46	0	13	
		23	10	7	1	64	0	30	
		26	11	8	4	68	0	86	
8	6	12	12	6	6	70	0	56	
		10	13	4	11	48	0	44	
8	7	10	14	6	5	60	0	8	
		19	15	6	6	61	0	7	
		27	16	10	0	90	0	58	
8	8	20	17	6	8	62	0	28	
		5	18	6	2	49	0	17	
8	9	9	19	6	7	58	0	44	
		18	20	8	2	62	0	25	
8	10	20	21	7	8	89	0	40	
		15	22	6	1	75	0	21	
		...	23	4	5	47	0	9	Between trees 10 and 11.
8	11	8	24	4	3	44	0	22	
		13	25	6	6	69	0	62	
		14	26	4	8	57	0	25	
8	12	13	27	5	0	78	0	26	
		11	28	6	7	45	0	9	
		8	29	7	6	70	0	31	
8	13	10	30	3	7	48	0	15	
		19	31	9	0	64	0	47	
8	14	23	32	6	9	61	0	28	
		20	33	6	10	59	0	30	
		12	34	3	11	46	0	9	
8	15	13	35	5	5	56	0	35	
		19	36	9	6	68	0	118	
8	16	19	37	8	10	59	0	35	
		...	38	4	6	54	0	27	Between trees 12 and 13.
		11	59	6	0	66	0	51	
8	17	...	40	8	0	52	0	25	Between trees 12 and 13.
		18	41	6	4	64	0	26	
		22	42	6	0	60	0	16	
8	18	28	43	9	0	61	0	70	
		18	44	4	9	39	0	8	
		11	45	5	2	47	0	36	
8	19	9	46	4	0	32	0	18	
		15	47	6	0	53	0	30	
8	20	21	48	5	4	40	0	20	
		15	49	4	8	63	0	17	
		6	50	4	0	49	0	12	
8	21	7	51	4	3	45	0	12	
		8	52	4	0	52	0	21	
		16	53	4	6	54	0	40	
Carried over ...	...	...	...	323	6	3,102	0	1,655	

B—*Contd.*

Compartment number.	Line number.	Coal tar number.	Label number.	1899-1900. Girth.		Crown diameter.		Yield, in tolas.	Remarks.
1	2	3	4	5	6	7	8	9	10
				Ft.	In.	Ft.	In.		
Brought forward ...	...	...	...	323	6	3,102	0	1,655	
8	22	20	54	9	0	56	0	52	
		15	55	6	1	42	0	11	
		6	56	4	0	43	0	17	
8	24	5	57	7	2	60	0	28	
		23	58	4	5	42	0	14	
		25	59	5	7	51	0	60	
8	25	18	60	6	9	55	0	13	
		11	61	5	1	48	0	25	
8	26	5	62	6	2	89	0	62	
		7	63	4	10	49	0	15	
		17	64	5	5	54	0	28	
8	27	18	65	4	10	58	0	41	
		9	66	5	4	59	0	6	
		6	67	8	2	59	0	36	
8	28	4	68	8	6	75	0	28	
		12	69	4	5	52	0	26	
8	29	12	70	8	0	74	0	24	
		4	71	6	7	59	0	22	
8	30	4	72	9	9	67	0	26	
8	31	5	73	6	10	58	0	6	
8	32	5	74	4	3	42	0	25	
8	33	2	75	5	1	59	0	19	
8	34	2	76	4	10	64	0	20	
8	35	3	77	10	5	70	0	22	
Total ...	...	...	...	475	0	4,487	0	2,281	

Statement showing total Number of Trees measured, total Girth and Crown Measurements, as well as total yield of Rubber of measured Trees of Compartments 4 *to* 8.

Number of compartment	Total number of trees measured.	Total girth measurements.	Total crown measurements.	Total yield of rubber of measured trees, in tolas.	Remarks.
1	2	3	4	5	6
		Ft. In.	Ft. In.		Spread per tree, Outturn per tree.
4	100	1,064 0	6,415 11	3,362	64′ ... 33½ tolas = .83 lb.
5	162	1,476 1	9,843 7	5,414	61′ ... 33⅓ „ = .83 lb.
6	95	703 0	6,035 6	3,896	63′ ... 41 „ = 1 lb.
7	96	649 3	5,815 0	3,769	61′ ... 39 „ = ·97 lb.
8	77	475 0	4,487 0	2,281	58′ ... 29½ „ = .73 lb.

Statement shewing Comparison of Yield of Trees tapped during 1896-97 to 1898-99.

Consecutive No.	Number of compartment.	Number of line.	Number of tree.	Consecutive number of trees west to east.	Yield, in tolas. 1896-97.	1897-98.	1898-99.	Remarks.
1	2	3	4	5	6	7	8	9
1	3	17	3	18	64	48	14	A fairly large tree. The trees next adjoining on the east and west are each 35′ distant and have not interfered with the growth of this tree, which has space 85′ × 35′.
2	3	18	3	23	20	15	38	A tall tree, girth 5′ 3″ only. Tree next adjoining on the east is 17′ and that on the west 38′ distant. Both of these have so seriously interfered with the spread of this tree that the space of $\frac{85}{2}$′ and $\frac{100}{2}$′ on the south and north have been of no use to it.
3	3	21	3	24	188	112	5	Large dominant tree. The tree next adjoining on the east is 18′ apart from it, which, being suppressed, is not interfering with the growth of this tree, but that on the west, which is 24′ distant, is interfering. It has space of $\frac{95}{2}$′ on the other two sides.
4	3	25	3	27	120	44	8	Fairly big dominant tree Trees next adjoining on the west and east are 15′ and 25′ distant, respectively, but both are suppressed. It has space of $\frac{92}{2}$′ on each of the other two sides.
5	3	27	2	16	188	166	28	Large dominant tree. Next tree on the west is 43′, those on the east, north, and south are 44′, 60′, and 50′, respectively. None of these are interfering with the growth of this tree.
6	3	26	1	25	175	284	1	The tree next to this on the line is 66′ from it. On all other sides it has space of 100′ × 50′. A fine tree.
7	3	25	2	28	80	122	1	A dominant tree. Tree next to it on the west, which is 24′ distant, is suppressed, while that on the east is 31′ distant and is interfering with its growth. Space on each of the other two sides is $\frac{92}{2}$′.
8	3	21	5	22	75	97	2	A tall tree. Tree next adjoining on the west is 18′ and that on the east 20′ distant. The former is entirely suppressed, but the latter is equally big and interfering with its growth. It has space of $\frac{95}{2}$′ on each of the other two sides.
9	3	18	2	25	70	36	6	Fairly big tree. Next trees on the east and west are 17′ and 25′ distant, respectively. Both are interfering with the growth of this tree. Next tree on the south is 85′ and that on the north 100′ distant.
10	3	17	2	19	15	31	20	It was a dominant tree. The tree on the east in the line is 22′ and that on the west 33′ distant. On other sides it has space of 42′. Nearly all its big branches have been blown down in the recent storms.
11	3	8	2	2	90	150	3	Large dominant tree. The next tree on the east in the line is 21′ and that on the west 27′ distant. Both of these are under suppression. It has space of 40′ on the south and 45′ on the north.
12	3	19	2	14	71	104	30	Large dominant tree. Trees next west and east in the line are 23′ and 15′ off from it respectively, both of which are entirely suppressed. Next tree on the north is 80′ and that on the south 67′ distant.
13	3	19	8	21	42	79	4	Large dominant tree. Trees next on the west and east are 16′ and 23′ distant, respectively, both of which are nearly suppressed. It has space of 40′ on the north and 34′ on the south.
14	3	21	14	10	78	80	2	A large dominant tree, having spreading branches in every direction. Trees next on the west and east in the line are 23′ and 14′ off from it, respectively, both of which are entirely suppressed. It has space of 47′ on the south as well as on the north.
15	3	20	14	15	110	147	2	A fine tree. Trees next on the west and east in the line are 21′ and 32′ off from it respectively, both of which are nearly suppressed. It has space of 50′ on the south and 47′ on the north.
16	3	6	10	3	92	[illegible]	1	A dominant tree. Next tree on the west is 26′ and that on the east is 18′ from it. It has space of 45′ on the south and 50′ on the north.

Statement showing Comparison of Yield of Trees tapped during 1896-97 to 1898-99.—Continued.

Consecutive No.	Number of compartment.	Number of line.	Number of tree.	Consecutive number of trees west to east.	Yield, in tolas. 1896-97.	1897-98.	1898-99.	Remarks.
1	2	3	4	5	6	7	8	9
17	2	3	20	4	71	51	1	A small tree. Tree next on the east 23′ off from it, and is interfering with its spread, while that on the west is 20′ distant, which is being suppressed. It has space of 35′ on the south and 55′ on the north. The tree is exposed to too much light, and the rain water lodges here during the rains.
18	2	3	18	9	60	136	81	A large dominant tree. Next tree on the east is 22′ from it, which is entirely suppressed, while that on the west is 21′ from it, and, being a big tree, interferes, with its spread. It has a space of 50′ on all other sides.
19	2	5	18	8	132	72	25	A large dominant tree. Next tree on the west, which is 37′ distant, is interfering with the spread of this tree, and that on the east is 14′ from it, which is being suppressed. It has space of 48′ and 56′ on the south and north, respectively.
20	2	6	3	7	72	36	27	A large dominant tree. Next trees both on the west and east are 24′ from it, and are under suppression. It has space of 56′ on the south and 50′ on the north.
21	2	5	45	2	35	27	40	A dominant tree. Tree next on the east, which is 22′ distant, is entirely suppressed, while that on the west is 20′ from it, which is interfering with the sprerd of this tree. It has space of 40′ on the south and 42′ on on the north.
Total yield, tolas ...					1,848	1,929	339	
„ „ lbs. ...					46	48	9	40 tolas have been taken as equivalent to 1 lb.

A. S. P. O. (Rev) No. 407—110—31-12-1900.

FICUS ELASTICA FROM SEED.

Ficus elastica, like all other figs possesses very small dustlike seed, and some planters have found it difficult to raise. It should be sown in boxes of fine earth, and the boxes should be isolated over water, to keep off ants. The ants are very troublesome in many places in destroying small seeds when sown, carrying them off to their nests and nibbling them to pieces. A good plan adopted at the Ayer Keroh Gardens, is to put the boxes on wooden stands in a pond and as the plants grow sufficiently tall to be transfered to the ground, fresh seed is sprinkled in the box. A number of plants were raised very successfully by sprinkling the seed in the moss in orchid pots, in the Botanic Gardens in Singapore. Here the ants did not find them, and indeed had no soil to make their nests in.

Raising turf from grass seed here is almost always a failure on account of these ants, which very soon find out the seed sprinkled on the ground. I have quite large piles of the nibbled up remains of paddy and other seed thrown out of the nests of these insects, which must destroy a considerable quantity of seed.—Ed.

THE DEMAND FOR INDIA RUBBER.

There is no question that the world's demand for India rubber is rapidly equalling its available supply. Hence higher prices for the raw material are progressively demanded, greater profit is therefore assured to the grower, and greater incentives are thus given to develop existing supplies and to create new ones, and further to ensure the most careful collection and most thorough curing. Some eight years ago the price of Para rubber was about 2*s*. 6*d*. per lb. This has steadily advanced until the price to-day reaches 4*s*. 3*d*. per lb., whereas the cost of collection remains practically the same. The use of India rubber tyres for carriages, cabs, motor-cars and bicycles has generally increased the demand, and this promises not only to continue but to become greater year by year. It would be impossible to estimate the number of vehicles thus fitted, but there must be many hundreds of thousands. At the same time every development of electricity for either lighting, power or telegraphy, every ocean cable, requires an increased supply of rubber for insulation and other purposes.

The finest quality of raw rubber is Para, so called because it is shipped from a port of that name at the mouth of the Amazon, being sent down from the upper reaches of that river, where for the past fifty years the natives have been in the habit of collecting and preparing it—thus attaining considerable efficiency for long experience. There is no reason why the same quality of gum should not be secured from other sources if only the same skill and care are employed. This cannot be urged too strongly upon the planter, for a badly collected gum is comparatively worthless, fetching only 1*s*. or 1*s*. 2*d*. per lb., whereas with necessary atten-

tion directed by experience 3*s*. to 4*s*. per lb. may be secured. The Hevea Braziliensis yields the most satisfactory results on the Amazon and elsewhere, both in quantity and quality of milk. The climatic conditions favourable to its development are—a hot damp atmosphere, with the greatest possible amount of saturation, and a fairly dry warm soil. Excessive flooding is liable to cause "wet feet," thus preventing the growth of the tree and oftentimes proving fatal to it.

The trees are tapped when upwards of 8 to 10 years old. The incisions are usually made in a series of V-shaped channels connected with each other by a horizontal channel about ⅜ inch deep by ¾ inch wide. These must be most carefully cleansed and freed from any particle of sand, bark, vegetable fibre or grit of any kind. The collecting cups and cans also must be perfectly clean, for cleanliness is really the first care, and upon its due observance depends largely the resulting product. The rubber manufacturer must have his raw material absolutely clean, and to secure this result the rubber is subjected to a process of rolling and heating and tearing between grooved friction rollers under a stream of water which washes away the foreign matter. Growers should always remember that the value of the rubber to the manufacturer is the value of the weight of the washed product, not of the raw gum, as imported. In this connection we may mention that Para rubber will lose from 5 to 15 per cent. in weight, whilst some badly collected rubbers will lose as much as 50 to 70 per cent. The evil effect of this introduction of foreign matter is not limited to the corresponding loss of weight, for the necessary heating, tearing and rolling the rubber tends to weaken the gum, to reduce its tensile strain and to break up its fibres, thus often causing a loss of the vitality of the rubber of from 5 to 25 per centage of foreign matter removed.

Most unfortunately the otherwise good rubber of Rangoon and Assam contain 20 to 30 per cent. of barky matter, which render them unsuitable for the higher classes of work, as oftentimes some of these particles eventually find their way into the manufactured article. The waterproofing of a garment, the insulation of an ocean cable, or indeed any fine work may be rendered useless by the presence of these particles. In the case of a cycle inner tube, the grain of sand may become embedded in the thin structure of the tube, inflation causes this grain to "pop" out, subsequent inflatations extend this point of fracture into a bubble which eventually bursts and spoils the tube. And yet all these difficulties could so easily be avoided by the exercise of due care in collection. It would not cost the collector much to make a practically clean rubber, whereas, on the other hand, the increased profit obtained thereby would be considerable. A few years ago the Congo rubbers were carelessly collected and realised barely 1*s*. 3*d*. to 1*s*. 6*d*. per lb. Now by careful collection good prices can be obtained, in some cases as much as 4*s*. to 4*s*. 3*d*. per lb. Cape Coast kinds have advanced from the same cause, whilst on the other hand many brands have decreased in price from careless and imperfect collec-

tion. Nothing prejudices a rubber brand so much as continued depreciation of quality. At first, price is considerably reduced, and if continued the material is discarded by all good buyers, and become relegated to the rubbish heap or unreliable products.

All this has reference to what one may regard as accidental adulteration arising from carelessness. Many rubbers are designedly loaded to gain weight. The readers will note how absurd such a policy is, and how ultimately it must result in loss and discredit. There is, however, another form of adulteration which will in time destroy the reputation of any brand and effectively exclude it from the markets of the world. This is the designed admixture of inferior gums, such as *Euphorbia* and many others of the resinous class, with the intention of illegitimately increasing the immediate profit. But the brand once detected in this condition will be for ever disregarded. After due care has been observed in collecting the milk, there come the process of curing. This also requires the greatest care in order to yield the desired results. The method employed by the Amazon workers is to dip a wooden paddle (perfectly clean) into the milk can. A layer of sap then adheres, and this is coagulated by the smoke from a vegetable fibre. The paddle is repeatedly dipped, the object being to have each layer as thin as possible so that the whole mass may be quickly cured, thoroughly yet not excessively. This is necessitated by two considerations: in the first place to ensure that all the sap is thoroughly coagulated, failing which the immature piece will lose in washing from 5 to 20 per cent., and in the second and most vital and important place, to secure the freedom of the gum from the presence of rubber resins.

Some eight years ago Professor HENRIQUE, of Germany, made some investigations into the causes of the depreciation of the quality of vulcanised India rubber under the influences of heat, time and sunlight. The effects noted were—that some rubbers become hard, brittle and rotten, whereas other rubbers under the same conditions retain their old strength and vitality. The Professor traced the cause of this to the presence of quantities of rubber resins in the defective samples, and explained that the 5 per cent. of sulphur originally introduced for the purpose of vulcanisation had formed considerably traces of sulphuric acid in combination with the resins, which in course of time had destroyed and rotted the rubber. This fact, having been experimentally verified, led to the issue of an order by Sir A. M. RENDEL, on behalf of the Indian State Railways and of the Indian Government, limiting the percentage of rubber resins in any manufactured articles to 5 per cent. This test has been rapidly adopted by all Government Departments and has now become the standard for all high class goods. Hence the manufacturer cannot afford to use any gum which does not meet this requirement, for he cannot afford to run the risk of rejections. Thus it becomes of the first importance to the rubber grower to see that his product meet this requirement, or he will quickly find his article relegated to the position of a third rate brand. Some experiments have recently been made with a chemical treatment by alcoholic

soda to effect the removal of these resins, but we have yet to await the result of time and climatic conditions upon the article thus treated, and also to know the cost of this process upon a commercial scale. Yet nothing can be easier than to prevent the formation of this inferior sap by an efficient and thorough method of curing. By so doing the waste and destructive element is converted into valuable gum, a bigger price is obtained, and reputation is assured.

Having endeavoured to point out the dangers of dirt and resins, the question arises, how can these difficulties best be met. The wonderful development of the Congo rubber and its vastly extended and improved quality are due to the importation of experienced Amazon experts, who brought with them a knowledge of their art, acquired through many years of practical experience—not a difficult or expensive experiment. By employing real experts a good rubber can be relied upon, and this will always command a ready market and good price, and secure for the producer both reputation and profit.—*Madras Mail.*

MALAY RUBBER.

Lanadron Estate,
Muar, via Singapore.
Straits Settlements.

"The following is an extract from the India Rubber and Gutta Percha Journal of May 12th, 1902.

We have in our possession a sample of rubber obtained in the Malay States, from a Hevea plantation, which can only be described as exquisite. The following are the technical and chemical constants of this sample :—

Loss on washing	Nil.
Resinous matter	0.86 p.c.
Ash	0.11 p.c.

The sample is free from any smell, and almost perfectly transparent. Evidently, rubber manufacturers have something to look forward to."

F. PEARS.

MALAY RAMBONG.

The following is an extract from a letter received from the Director of the India Rubber, Gutta percha and Telegraph Works Company, on Aug. 2nd, 1902.

"We have examined the sample of rubber which you submit and which is known as Getah Rambong. The sample is a small one but the tests we made showed that it contained 5.1 per cent. of Resin and Organic matter and it lost in washing 10.8 per cent. With regard to the questions you ask we estimate that when Para rubber is selling at 3 shillings a pound, the value of Getah Ram-

bong may be approximately 2/6. The rubber when vulcanised is slightly softer and considerably weaker and does not stand the heat test so well. We cannot well suggest any way of preparing this rubber as this is a question which does not come under our notice in manufacturing. The only thing that we can say is that in the collection of this rubber great care should be taken to prevent any extraneous matter from incorporating itself in the mass during drying and all chemical assistance to the drying of the milk should be avoided.

CRUDE RUBBER.

TO THE EDITOR OF THE "INDIA-RUBBER AND GUTTA-PERCHA JOURNAL."

DEAR SIR,—There is a great deal of activity going on here in rubber planting, and the Peninsula must before long be an important rubber producing country. The soil and climate seem to be particularly suitable for the cultivation of Para (Hevea Braziliensis) and Ficus (Ficus elastica), and should the results equal the experiments which have been carried out from time to time this country will afford a very profitable field for investment in this direction. Straits rubber has, I believe, a bad name, this is because it is more or less a heterogeneous collection of indigenous rubbers and saps collected by the natives, and, of course, we planters do not wish to associate our cultivated product with this variety. Although my own estate is not yet in the productive stage, yet I can extract sufficient latex to make small experiments, and I read with very great interest your remarks on crude rubber. From these articles I learn that a great deal of waste occurs in the washing process in consequence of adulterants. Well, Sir, I am only anxious to turn out as pure a rubber as possible, and I am prepared to do anything in reason to accomplish this, but being a planter I know nothing about the manufacturing side. Since there is a process of cleaning rubber, would it not be possible to accomplish this on the estate, and so avoid paying freights on useless material, or, better still, so prepare the milk as to avoid this washing process? With scrap it is quite impossible to collect the latex in a pure state; an admixture of rubber bark and soil always results.

If you would, through the medium of your valuable paper, advise the planter what to do, you would be conferring a great benefit upon the community. I know there is a great deal of diversity in the opinions as to the best means of coagulating the latex, one is recommended alum, spirits, centrifugalization, smoke, and various other methods, one of which is to allow coagulation to take place naturally. I was privileged last December in the company with Mr. FOX, the assistant director, Singapore Botanical Gardens, to take part in an experimental tapping of some Ficus trees ($5\frac{1}{2}$ years old) belonging to Mr. TAN CHAY YAN, of Malacca. From $3\frac{1}{2}$ imperial pints of latex were obtained 2 lbs. 10 ozs. of dry rubber, which

was coagulated by adding water while the latex was still in the fluid state, and then boiling the mixture for about $1\frac{1}{4}$ hours in an earthenware pot. This rubber has since been valued in Mincing Lane at 2*s*. 6*d*. per lb., and described as "good, clean, fairly elastic, and dry." It is, of course, open to question as to whether the value would have been higher if some other means of coagulation had been adopted, but it would be interesting to know whether this sterilizing of the latex is likely to deteriorate it in any way, as otherwise it seems to be an effective, and handy method of coagulating. Some information on this point would be very useful.

I trust I am not unduly intruding upon your valuable space in asking you to insert this letter, as I think a great deal of good could be accomplished if the manufacturer and planter had some means of communicating with each other and discuss this important subject.—I remain, Dear Sir, yours faithfully.

FRANCIS PEARS,
Lanadron Estate, Muar, via Singapore,
April 19th, 1902.

In our last issue the reader will have observed a letter from Mr. FRANCIS PEARS bearing upon the subject of "Rubber Planting in the Malay Straits."

It is quite refreshing to read that the rubber planters themselves are waking up to the importance, or rather to the unique opportunity, offered by a rubber plantation of producing a crude rubber which, not rather more than ordinary accuracy requires, comes up to its description. Indeed, the rubber planter will miss a great opportunity if, at the very outset, he does not take steps to put his production upon the market in such a condition as to render all washing operations in the factory entirely superfluous. He has it in his own hands to produce a "crude rubber" which, as a matter of fact, for manufacturing purposes is a rubber 99 per cent. pure.

At the present moment fine Para loses from 12 to 18 per cent. in weight in the washing process, and by shipping his rubber in the above-named condition the planter would save, to begin with, from 12 to 18 per cent. in freight, and the manufacturer could well afford to pay for such rubber, at the present price of fine Para, from 4·5*d*. to 6·5*d*. more per pound, and save the cost of washing and drying into the bargain. But, as a matter of fact, the increased value of rubber shipped in the pure state would be rather more than these figures, for the simple reason that a dirty rubber, when washed, is by no means worth as much as the same rubber would be had it been prepared at the plantation free from all earthy or vegetable, as also free from all discolouring, fermentable, and deleterious matters.

Of course the most obvious and the most easily attainable result for the rubber planter to aim at is to ship his rubber free from earthy matter, leaves, bark, wood and the like, and moisture. But an enormous improvement in "crude rubber" can also be effected by keeping it free from albuminous matter. It is not too much to

say that crude rubber without any of these impurities would in itself produce a minor revolution in a great many of our india-rubber manufactures.

As a matter of fact, we already possess a method by which the rubber latex can readily be deprived of its albuminous substances, and this method, known as Biffen's centrifugal method, can easily be applied on the rubber plantation. But it is also well known that the rubber after this treatment will readily coalesce into larger masses, which can then be handled; it is also tolerably well known that this coalesced rubber differs not immaterially from coagulated rubber by its peculiar flabbiness or lack of "nerve." I may further state, as the result of recent experiments, that this difference goes even much deeper, and that there is a very remarkable difference in the vulcanisation results obtained with coalesced and coagulated rubber respectively. The difference is certainly not in favour of the coalesced rubber.

This unquestionably shows that the coagulation process must have an effect upon the rubber, the nature of which is at present only dimly recognised, but which I suggest will ultimately be found to consist in a polymerisation process.

From this it must not, however, be argued that my plea for removing from the rubber latex all albuminous matter will have to be abandoned, but rather that we shall have to find a mode of treating the coalesced—albumen free—rubber in such a way as to impart to it the required condition of polymerisation in an unobjectionable manner. This is a problem which may puzzle the planter, but which is capable of solution by the chemist. Indeed, I have substantial grounds for stating that this problem has already been solved with entire success, and is already practised on one of the largest rubber plantations in Central America.

The treatment in question not being public property at this moment, it is impossible to do more at present but to state its existence. As to its efficacy there is no doubt. The rubber produced by it is remarkably firm, almost colourless, and beautifully transparent.

The treatment could, of course, not be extended to scrap rubber, but on a rubber plantation with proper organisation of the collection of the latex the proportion of scrap rubber produced could easily be kept at a very low figure. Nor is there any reason why the planter should not effect the cleaning of the scrap on the plantation. The scrap then would still produce a rubber at least equal to the best crude brands now on the market.

The process of coagulating rubber latex by boiling, described in Mr. PEAR'S letter, is a piece of unmitigated barbarism invented by niggers, and about on a par with their intelligence. It is merely the solution of a problem by brute force, and it is to be hoped that with the advent of rubber planting this process will recede to the wilderness whence it came.—*India-rubber and Gutta Percha Trades Journal, June 23, 1902.*

RUBBER TREES AT BUKIT RAJAH

PLATE VI.

We give here a photograph of Para rubber trees grown among Ficus Elastica at Bukit Rajah Estate in Selangor. The trees were planted in July to September in 1899, and the photograph was taken in November, 1901. The rapid growth and distinct habit of the two trees are well shown.

THE HEVEA "PARA", INDIAN RUBBER:

ORIGIN OF THE INTRODUCTION AND CULTIVATION OF THE TREE,

By H. A. WICKHAM.

Although advertisements for sale of the seed of Para rubber (Hevea) at so much a thousand have now been commonly seen for some time past in all the planting Journals in Ceylon and the East, it is not generally known that to the initiation of the Government of India is due the fact that they are within the reach of the planting community at all. Any planter who has had practical experience with the seed of this tree will understand the difficulty which had to be encountered in getting the original stock plants established in the Eastern tropics at such distance from their primitive home in the high land forests of the valley of the Amazon.

In the first instance, as far back as the seventies, the initiation of the Government of India in backing liberally the recommendation of Sir Joseph Hooker enabled me to seize an opportunity, singularly occurring for specially chartering a steamship which happened to be up the Amazon River at the exact time of the fall of the ripe seed in the rubber forest. Had this not been so, I should never have been able to accomplish the feat of securing the large original stock from an only seed so prone to quickly lose vitality.

Just now there seems to be a disposition in some quarters to deprecate the efforts made by the Indian Government as bearing on the method best for the cultivation of the Hevea. This seems to be exceedingly short-sighted and ill-advised. As a matter of fact, in the hands of the Government of India through their forestry officers, all such experimental planting or cultivation cannot be calculated to be other than object lessons of the greatest value to practical planters in all the equatorial colonies, in that it will furnish them with authoritative data (especially the Hevea) of a nature to be depended upon.

The true "Para," Indian rubber (Hevea) is to be found growing naturally within the immense forest-covered area of the valley of the Amazon and in the tributary rivers, including the head streams of the Orinoco. I found it abundant high up on the Orinoco, above the junction of the Guaviare (the latter stream by right, indeed, should be styled the head stream of the Orinoco). It is plentiful on the banks of the Cassiquiare—that curious bifurcation by which

Para and Ficus Elastica,
planted, July—September 1899.

the Orinoco gives of a stream to the Rio Negro, and so converts Guayana into an immense island. I also found it growing in the interior betwixt the Tapajos and the Xingu. The rivers from which the largest supply is drawn now by traders are the Purus and the Madeira. In its native forests it grows dispersed among the other forest trees, two or three trees rarely being found in juxtaposition. In appearance the Hevea is a handsome tree, with straight cylindrical trunk—differing wholly from the Ule—the Indian rubber tree (Castilloa) seen in Moskito and Nicaragua to South Mexico. The wood is soft and perishable. The bark, as in the great majority of tropical trees, is not very thick, and is of a grey colour on the surface, but when scraped, approaches the appearance and colour of a light bay horse's coat. This cleaning has to be done, as in moister regions the bark is thickly coated with growths of moss, ferns and orchids. The seeds grow three together, in a sort of hard pod. This pod, becoming heated by the sun bursts when it is ripe with a sharp popping sound, and scatters the seed for a considerable distance around the tree. The seed is exceedingly oily and the oil extracted therefrom, closely resembling linseed oil, is a valuable product. The range of temperature in the Hevea forest is between 70 deg. and 90 deg. throughout the year. Rainfall varies considerably in different districts where Hevea are found, some districts being nicely divided into wet and dry seasons, each of about six months duration, while in others it rains more or less the year round. In such districts it is more difficult to collect the caoutchouc profitably, as if the stem of the tree is very wet when it is worked, the latex or rubber-milk, spreads over the surface, and is in large part lost. From what has been said it may be seen that the main part of the Indian rubber must be collected during the dry season, although "siringaros," who live near their "siringals," or rubber walks, improve their opportunity by tapping rainy season. But the trees are doubtless better for a half-yearly rest.

When the native hunter has discovered for himself a district of the forest in which "siringa" trees are sufficiently numerous and near together, he first connects them together by cutting a "picado," or path with his bush knife. Having thus discovered their relative bearing, he next straightens and clears out his paths, endeavouring at the same time to take in as many trees as possible in each path, and to make all the paths converge to a certain spot, where he puts up his "barirca," or curing station. This done, and having collected a supply of the old nuts of the Inaja (*Maximiliana regia*) or similar oily palm nuts, he is ready to commence operations on the first fine day. There is some diversity in the manner of taking the rubber latex in the Amazon valley. In some districts they prepare long strips from the inner pith of the foot stalk of the leaf of the Inaja or of the Bacoba palm. These are tacked obliquely round the stem of the trees, with sharpened pieces split out of hard covering of the same leaf stalks. These strips being smeared on the inside with wet clay, form a channel for collecting and conducting the latex milk into the cup placed to

receive it. In the other method, which I consider the better, the cups are put on in a ring round the trunk, usually a span apart. Three cuts about $1\frac{1}{2}$ inch long are made in the bark with a small axe. In this way the number of cups is proportioned to the size of the tree. Tin cups are used. They are made slightly concave on one side in order to fit the convexity of the tree trunk. They are attached to the tree by the use of a piece of the ball of kneaded clay, which each collector carries in his bag. The tapping always begins as soon as there is light enough in the forest path to see by. One man is usually apportioned to each path, containing say, 100 trees. When he has cupped his trees he sits down at the end of the path for half an hour or so, but as soon as he sees that the tree last tapped has ceased to drip the milk, he starts at a trot on the back track, detaching and emptying the cups into his calabash as quickly as possible. Speed throughout is a great object, as the milk latex speedily coagulates, and then can only be sold on the market for an inferior price, as serwambi, as compared to the obtained for that which has been smoke-cured. When the men arrive at the central hut from their different converging paths they each empty their quantum of the latex taken for the mornings work into one of the large Indian native earthernware pans, usually used as a receptacle. Care is taken to squeeze out with the hands all of the already coagulated curd-like masses. These are thrown on one side to be made up into balls. Earthen pots in form of miniature kilns are placed over small fires, and the "siringero" sits down to the really tedious part of his business. He drops a handful or so of the oily palm nuts down the narrow neck of the kiln, and forthwith arises a dense smoke. Taking a wooden mould like an ace of spades in form, and holding it over the pan, he pours some of the latex over it in a thin film keeping it turned, so that it shall not run off before he succeeds in setting it to an even surface, which it soon does as it passed backward and forward through the column of smoke. This is continued one coating after another, until he has finished the day's supply of rubber-milk. He then sticks his mould up in the thatch of the roof of the shed for the repetition of the process next day, and until he finds the thickness of the biscuit makes the mould unwieldly to handle, when it is cut down one side, slipped off, and stored. This is the native method, which can without doubt be improved upon under conditions of systematic cultivation.

But as all the stock of plants or seed available for the planting and cultivation of this tree in the Eastern tropics are and will be derived from direct lineal descendants of some or other of those 7,000 odd originally introduced by me at the instance of the Government of India in 1876-77, it may be well if it be recollected that their exact place of origin was in 3 deg. of south latitude, and to remember their natural conditions there. This the more so since a very general error seems to have obtained that swampy or wet lands are the fitting locality for the Hevea. This would seem to have arisen in that the "explore r" of a few years' experience would have some of these trees pointed out to him (naturally in answer to

enquiries) growing scattered along the wet margins in going up the lower Amazon or tributaries, whereas the true forests of the "Para" Indian rubber tree lie back on the highlands, and those commonly seen by the enquiring traveller are but ill-grown trees which have sprung up from seeds brought down by freshets from the interior.

As a matter of fact, the whole of the Hevea which I procured for the Government of India were the produce of large-grown trees in the forest covering the broad plateaux dividing the Tapajos from the Madeira rivers. The soil of these well-drained, wide-extending-forest covered tablelands is a stiff soil, not remarkably rich, but deep and uniform in character. The Hevea found growing in these unbroken forests rival all but the largest of the trees therein, attaining to a circumference of 10 ft. to 12 ft. in the bole. These forest plains, having all the character of widespread tablelands, occupy the space betwixt the great arterial river systems of the Amazon, and present an escarped face, which follows, at greater or less distance, and abuts steeply on the igapo or bagas *i.e.*, the marginal river plains subject to inundation by the annual rise of the great river. So thorough is the drainage of this highland that the people who annually penetrate into these forests for the season's working of the rubber have to utilise certain lianas (water-bearing vines) for their water supply, since none is to be obtained by surface-well-sinking, in spite of the heavy rainfall during great part of the year.

The Hevea is much more amenable, better adapted for systematic cultivation, planting, and working than any other of the rubber-yielding trees with which I am acquainted for instance, the Ficus elastica of the Eastern tropics or the Ficus regia of New Guinea, and probably of Malaya; the various species of jungle rubber vines of the East and of New Guinea and tropical Africa; and, to a less degree, the Castilloa and Ceara of tropical America. The remarkably shapely cylindrical form of the lower trunk (the workable part of the tree) from the ground upward renders it singularly adapted to reqular extraction of the rubber latex, and although the latex of the Hevea does not appear to lend itself to the process of separation by centrifugal separating machines, as do the Castilloas of Guatemala and Southern Mexico, the "Para" rubber, produced by a simple smoke process which has been devised always commands the best market price.

In New Guinea I was in 1894 first to discover a vine growing in the forest there which produces a very fine quality of Indian rubber. There is also a large forest tree, native of these forests, (a species of ficus) which yields a good class of rubber in quantity. None of these, however, being so suited (so amenable) to cultivation in plantation as the "Para," it is much to be recommended that cultivation of the Hevea be encouraged in that late and undeveloped possession of the British Empire. Now that it has been established in the East, there should be no great difficulty in bringing it down from Singapore; and I have myself seen large tracts of forest and jungle land in New Guinea which are admirably adapted for the planting of this, the premier rubber-producing tree.

The conditions required for the successful and profitable cultivation of Para (Hevea) Indian rubber are in my opinion, that it be regarded as a plantation—a cultivated product—rather than as one to be planted with view of being widely disseminated, under canopy, of an area covered by primitive standing forest. This opinion, formed at the time of the original introduction of the Hevea to cultivation at the instance of the Government of India in 1876, has been strengthened by subsequent years of planting experience, and I am convinced that any advice for the setting out of the Hevea rubber-tree as a self-disseminating forest product *i.e.* planting it out under canopy through wide areas of existing forests or jungle will be found to be founded on fallacy. The Hevea has no light winged seed, as mahogany and others, on the contrary, although the seed is scattered to some extent around the parent tree by the bursting of the ripe triform pod, it should be remembered that the seed is in form an exceedingly heavy and oily nut, and falls thickly in a circumscribed area. Even there it is exceedingly attractive to every four-footed creature of the jungle, who devour it greedily. In its own forests it owes its preservation only, as I think, to the fact that very venomous and large snakes, the saracucu, are in the habit of lying in waite about the base of these trees, in seeding time, and so ward off to a great degree the agouti, Indian rabbits, and other rodents. Forest deer, also, in my experience, are very destructive to the young plants. In any case I have found that Hevea take at least three times as long to come to productive size grown under forest shade as under plantation cultivation free from top shade. Lateral shade to the extent required, at first, for formation of a straight trunk form is readily got by allowing intermediate "second growth" to come up between the young Hevea for myself, I have known these trees when grown in the open, seed abundantly in three years, whereas they would have taken 10 to 12 to do so in the shade of the woods. It is therefore recommended that Hevea should be systematically grown in cultivated plantation. For spacing distance, I advise the half chain (33 ft. by 33 ft.) diagonal, as giving more root scope. This gives 40 trees to the acre. Besides being a good distance, the half chain is of practical advantage in marking off forest land, as by opening lines with the prismatic compass or theodolite, the man following can plant the seed to stake as the chain is drawn over the lines. As soon as the young trees attain proper trunk form the more light and air they are given, and the cleaner they are kept, the stouter and quicker will be their growth, and in the fourth to fifth year they would be in a condition to yield to a first tapping for rubber latex; say, by using two cups taking on an average a pound (1 ℔.) of rubber during the drier season of that period. The empty tins used for "preserved milk" answer admirably for this purpose, as they are of about the right size, and being made of thin tin readily bend to the shape of the tree trunk. The operation if carefully done will not arrest the growth of the tree. It is rather shown from experience that accumulation of the latex in the bark of the trunk of the trees is augmented thereby. For the purpose of extraction there has yet, as I think, been no better instrument de-

vised than the ordinary carpenter's chisel, carefully used with a light mallet. The cuts (three oblique cuts one above another, should be clean cut, and should not penetrate into the wood of the tree. Caution should be exercised in this respect, as if the wood is injured certain species of boring beetles attack the tree. The spacing should be about a span apart, one circle round the trunk of the tree beginning at the ground surface for each day's tapping, and so giving an increased number of cups in use as the tree grows in circumference, with proportionate increase in yield of the latex.

One advantage of the close system of cultivation recommended, besides greater economy in working is that centrally placed curing stations can be secured. This is necessary in order that the latex may be quickly treated, so soon as it is taken from the trees or much of it will become coagulated before it could be subjected to the smoke-curing process, and so lose the higher market value.

The Hevea is naturally a large tree, under favourable conditions attaining a girth of 12 ft. in the bole. To stint it in matter of root space or scope will be found to be false economy. I would, therefore, strongly deprecate closer planting than that recommended, *viz.* half chain (33 ft. by 33 ft.), 40 to the acre. Planted and cultivated at this distance and giving say, 5 lbs. of rubber per tree at 3*s.* only per pound, it would yield at the rate of some £30 per acre for sale of rubber alone, apart from value of the seed crop, to be converted into oil worth £25 to £30 per ton.

The Contract Journal, January 8th, 1902.

METHOD OF EXTRACTING RUBBER FROM THE BARK OF RUBBER VINES.

A series of buildings for exploiting the bark of the wild rubber vines in Cochin China are being built. A factory containing machinery for treating 2 to 3 thousand kilogrammes of bark a day is in course of construction at Cho Quan (province of Cholon). The barks employed are those of Day-Che and Day Nam do trong. The method of treatment will consist in putting the dry bark of the vines to macerate for 4 or 5 days in sulphuric acid at 50 degrees, the cellulose is then destroyed and carbonized, when the rubber remains unhurt by the acid, when taken out of the acid bath, the bark is washed to free the rubber from the acid and especially to recover the acid, which is eventually obtained by evaporating the water in which it has been washed. The disintegrated bark is then put under the action of a separator which can be moved either by hand power or machinery. It receives meanwhile currents of water alternately hot and cold and by this action the bark already dissolved by the acid goes off in a state of mud, the rubber separated collects in sheets about a centimetre in thickness. This operation is rapid enough and scarcely demands more than hand labour, since on 100 Kilogrammes of bark the acid required for the solution 100 Kilogrammes reduced it is since from 50 to 45 degrees only entails a loss of 2 Kilogrammes. The rubber

thus treated appears completely aseptized, and its commercial value does not seem to be diminished by later alterations such as are due to long storage and climatic influences which affect some varieties of rubber prepared in other manners.

The inventor of the project estimates that the product thus obtained, in the proportion of 5 to 6 per cent. for bark of the Day che and 6 to 7 per cent. of that of Day Nam do trong is chemically pure in a proportion of 95 per cent. The value of 11 francs 50 per Kilogramme which he expects for it is as much as that of Para rubber.—*Deiss. Bulletin Societé Centrale Agriculture Colonial 1902, p. 51.*

MALACCA AGRICULTURAL SHOW.

The Agricultural Show was held at Malacca on Saturday the 26th July, and was well attended by a large and interested crowd of natives as well as by all the European community. The competition was restricted to residents of Malacca and to exhibits cultivated, manufactured, collected and reared within the Settlement, and included all manner of agricultural and jungle produce, livestock and manufactured articles of various kinds, besides silver and tinware, models, needlework, jewellery and general curiosities. The rice and padi exhibits were hardly as good as usual, but this was perhaps due to a succession of bad harvest years. The fruit was very well shown, upwards of fifty kinds being shown, including Langsat, Kondongan, Tampoi, Rambai, Bachang, Binjai, Sweet-sop, Sour-sop, Bullock's heart, Chiku, Sentol, Rambutan and Pulasan, Mata Kuching, Durians (good); Mangosteens (very good); Jack, Champedak, Keledang, Tampuni, Bread-fruit, Pumelo, Oranges (few); Limes (most of the well known varieties), Kembola, Blimbing, Jambu Ayer Mawar, Tamarind, Chermei, Asam Glugor, Petai, Jering, Caranda, Nelumbium, Sauh, P'rah. Pomegranates, Rukam and Guavas were but poorly represented. Of Papayas only the large form was shown. The Bananas might have been been better exhibited as Malacca pisangs are famous. There was one remarkable specimen of Pisang Mas shown; a spike of great length, completely covered with very close set small fruit. There were one or two good pines but the kind most exhibited was of poor quality though of good size. The fruit was indeed the special feature of the show. Vegetables were in some respects very good. Pumpkins and Gourds being especially well shown. The Brinjals were also well represented. A fine yellow variety being especially striking. Cucumbers were good and several fine forms were shown. Beans of several kinds, Chilies, Yams and Kladis were also exhibited. Onions and Shallots might perhaps have been better. Herbs and Sambals for Curries were fairly good. A special prize was awarded for a most exceptional dish of Tomatos of unusual size. Under general produce came Tapioca and Sago, of first class quality. Gambir, good, and the well known Malacca Tea, Coffee and Pepper were less satisfactory, the exhibits

being scanty. Rubber was represented by excellent samples of scrap-rubber, both Para and Rambong from Tan Chay Yan's Estate, five and-a-half and six pounds respectively of each. They were very clean and good specimens. A little jungle rubber (Getah Grip) was also shown. Ginger was represented by numerous exhibits, the prize roots being very stout and good. Turmeric and Zedoaries were fair, but less striking. Coconuts were abundantly represented and some were of very large size. Only two samples of Copra were shown, there being no prize offered for this pro duct, which was a pity, as Malacca is a large Copra producer. Betelnuts were well shown, some very fine samples. Arrowroot was fair. Sugar canes of good style, though but few exhibits. Local Palm Sugar was well represented. There was a good show of Sireh leaves. Nutmegs and Cloves were not extensively represented and some of the exhibits of the former were unripe. Mr. C. CURRIER of Alor Gajah, took the first prize for Nutmegs with a good sample. Fibres, Damar and Rotans were poor. There was a good series of Coconut oils, and some samples of Wood oils. The Manufactures included Agricultural implements, baskets, ataps, mats, rope, fishing trap models, etc. The black rope was well shown, the prize sample being very neat and well made. Stock was very poorly shown. Bullocks and Buffalos being very scanty in numbers. This was doubtless due to the late prevalence of Rinderpest. The prize Goats were good but more might perhaps have been shown. Poultry was better, some of the ducks and geese were exceptionally fine. The Miscellaneous exhibits of needle work, weapons, walking sticks chiefly of kamuning wood and ebony, Betel boxes, trays and general curiosities were a highly popular part of the show.

The greatest credit is due to the Hon'ble Resident Councillor and his energetic Committee for the laborious work of getting up the exhibition which may be described as a very successful one.

RUBBER NOTES FROM THE CEYLON OBSERVER.

Is South American Rubber to go as South American Cinchona Went.

We are indebted to an old Ceylon friend in London for a copy of the subjoined compact and interesting statistics of Para rubber. In sending it on, he writes:—"The 30,000 tons now coming from Para and Manaos per annum will not be able to compete in cost of production with Eastern rubber; and I believe it will eventually go as did the South American cinchona bark." It is a little premature, perhaps, to anticipate in this way; but we must shortly attempt a forecast as to the probable output of Ceylon rubber from cultivated Para, and if we could get similar information from the Straits, the figures would be full of interest. Meantime here are the Para figures referred to:—

India-Rubber Annual Statistics.

Export from Para and Manaos—Quantities are in Kilograms—for 1900.

Exports.	Europe.	United States.	Total Exported.	Stock on the 31st Dec.
—	—	—	—	—
1900	14,313,996	12,434,667	26,748,663	931,000
1899	11,551,691	13,878,318	25,430,009	901,000
1898	12,078,742	9,830,265	21,909,007	1,336,000
1897	10,913,464	12,620,858	22,536,322	943,000
1896	12,556,424	9,045,450	21,601,874	1,062,000
1895	9,518,171	11,251,410	20,769,581	687,000
1894	9,012,658	10,461,030	19,473,688	846,000
1893	7,785,270	11,344,929	19,130,199	1,705,000
1892	7,077,623	11,431,559	18,509,182	919,000
1891	6,957,877	10,831,528	17,789,405	1,447,000

Rubber Planting in Costa Rica.

We draw attention to an interesting letter on his subject given in our daily issue and *Tropical Agriculturist* from Mr. EDWARD COLES, son of the late Rev. S. COLES, C. M. S., who has for many years, been settled as a coffee and cacao planter in Costa Rica. He deals today with Rubber and shows that in one district or valley as many as 600 hectares or 1,500 acres have either been planted, or are in course of preparation for planting. Labour, however, must be a difficulty as compared with Ceylon, the Straits or India, both as regards supply and price. Some interesting particulars are given by Mr. COLES. Planting Rubber trees at 20 to 30 feet apart is about the rule observed in Ceylon when Rubber is put among tea or cacao. We suppose when put in alone the distance between trees is less? We believe San Carlos Valley, Mexico, must be about 20 degrees North latitude as compared with 6 to 8 in our Ceylon Rubber planting districts.

The annals of the Royal Botanic Gardens, Peradeniya, of May, contains among other interesting articles one on Analyses of Ceylon Rubber and one on Jack Milk. The last part of the Analysis will be interesting to planters.

From the planter's point of view the chief lesson to be learnt from Mr. PARKIN'S work and the above analyses is to practise the greatest possible cleanliness in collecting and preparing rubber; any rubber dried on the tree or otherwise contaminated will sell for a much lower price as "scrap" or "negro-head." Mr. PARKIN'S method of collection in separate tins under each cut and placing water in the tins the great bulk of the milk can be brought in in the liquid condition and filtered, and can then be treated in clean tins, with or without acid, as local experience shows to be suitable. Quick drying is advantageous, but excessive heat must be avoided, as under its influence the rubber becomes sticky and loses most of its value; sample 5, which was dried on the tree in more or less sunlight, was thus deteriorated. It is shewn by a French chemist

that the milk of the jak tree is of no value in the rubber industry.

Raw Rubber for Australia.

Seeing that a successful pioneer India Rubber works has been established in Melbourne on a large scale by a Limited Company, it is quite evident that a good market for raw Rubber should be found among our Australian neighbours. No doubt, Colombo merchants, as well as local producers of Rubber will take note of this, and test the Melbourne market. It will be interesting to learn the result. Everything that tends to increase the trade between Australia and Ceylon is a matter of local interest, if not of importance.

Rubber Exports.

We are indebted to Mr. H. K. Rutherford for the following figures which show the wonderful development (albeit in value) of the India-rubber export trade from the Congo State, the return for last year being equal to about one-and-three quarter million £ sterling:—

Congo State Rubber Exports.

1898	...	Francs	...	15,850,987
1899	...	„	...	28,100,917
1900	...	„	...	39,874,005
1901	...	„	...	43,965,950

Ceylon Observer.

A DISCLAIMER.

On p. 408 of the August Bulletin No 10, under the Negri Sembilan Planters' Association report, there is a remark to the effect that "we trust that the Government will see that the Forest Officer has the Ordinance (Coconut trees Inspection) efficiently carried out." Mr. R. D. Hudson writes to say that he, as Forest Officer is not responsible for the carrying out of the Ordinance, as the Inspectors of Coconut trees are under the control of the Land Office.

CORRESPONDENCE.

Forest Office,
Taiping, 16th July, 1902.

To the Editor
Agricultural Bulletin,

Sir,—In reply to your correspondent A. Irving, in your issue for June asking if it is advisable to cut off the young shoots of Ficus Elastica "Rambong", I would advise him not to do any thing of the kind, no doubt such treatment would tend to make it more bushy, but it also allows rot to enter into the wood and I have always found anything of the kind gives the tree an adverse shock as it were.

There can be no doubt, I think, that every aerial root should be encouraged to reach the ground either by running it through hollow split bamboos with plenty of ventilation and dried grass or other vegetable matter placed inside them or by leading them down a piece of stick or string and old vegetable matter, grass, etc., being heaped round the tree which acts as a cool shelter against the sun and also adds manure to the soil.

I have seen many plants which were dead amongst the indigenous trees we have in our Perak jungles, and in, I think, every case, the cause of death may be traced to the severing of the aerial roots, therefore I think where possible one should be content to tap the main stems and branches and not the roots. We should remember this is not a tree proper and requires careful treatment.

Amongst my seedlings I have been lucky enough to grow a pink and green leaf variety and I have planted it at the Forest Bungalow, Taiping, as a King Edward VII Coronation tree.

Yours faithfully,

A. B. STEPHENS.

GOLDEN HOPE ESTATE,
KLANG, SELANGOR,
16th August, 1902

FICUS ELASTICA.

To the Editor
AGRICULTURAL BULLETIN:

Dear Sir,

Referring to letters you have received from Mr. IRVING and Mr. CAREY on the subject of lopping Rambong trees, I, some time back, wrote to Mr. DERRY, of Perak, for his opinion on the matter. I too being in doubt as to the advisibility of cutting branches or aerial roots of young trees. Mr. DERRY'S reply will no doubt be interesting to your readers: He says,—"I should on no account "cut away any part of Rambong trees. The main stem has no "advantage over the roots or any other stem so far as yield of "rubber is concerned [although it is best not to tap the roots "which yield the best rubber really.]

"When your trees are older, you will find the immense crown "which now seems a little jungle in itself will be lifted from the "ground and plenty of workable stems will then be available."

Mr. DERRY proceeds to state that to make himself quite clear would involve a long explanation, but that he was prepairing an article on Rambong for the Bulletin.

Yours faithfully,

EDMUND B. PRIOR.

NOTICES.

(1).

The Para Rubber trees in the Botanic Gardens, Singapore, are now commencing to produce the seed crop. Planters who have put their names down in previous years for seed, and no longer want any, are requested to write to the Director to inform him.

(2).

Correspondents acknowledging the receipt of Bulletins are requested to Stamp their letters fully, as a large number of letters have been received from various parts of the world either not stamped at all, or insufficiently stamped.

(3).

All applications for Bulletins should be made to the Editor who will also receive subscriptions.

SINGAPORE MARKET REPORT.

July, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	23	32.00	30.00
Bali	325	22.00	20.50
Liberian	168	19.50	19.00
Copra	3,285	10.25	9.00
Gambier	2,003	14.15	13.00
Cube Gambier, Nos. 1 & 2	196	22.50	18.00
Gutta Percha, 1st quality	...	450.00	300.00
Medium	...	300.00	150.00
Lower	...	150.00	50.00
Borneo Rubber	...	131.00	70.00
Gutta Jelutong	...	6.12½	5.75
Nutmegs, No. 110's	...	49.00	48.00
No. 80's	...	80.00	77.00
Mace, Banda	...	90.00	85.00
Amboyna	...	80.00	78.00
Pepper, Black	628	32.75	29.50
White	255	53.00	52.00
Pearl Sago, Small	100	5.30	4.67½
Medium	...	5.90	4.80
Large	...	6.20	5.80
Sago Flour, No. 1	2,830	3.82½	3.62½
No. 2	470	2.00	1.85
Flake Tapioca, Small	735	6.60	4.35
Medium	111	5.50	5.00
Pearl Tapioca, Small	480	6.75	4.35
Medium	598	6.75	4.40
Bullet	...	6.25	5.25
Tin	2,185	85.50	81.75

LONDON MARKET.

Arrowroot.—quiet. At auction on Wednesday a fair quantity of St. Vincents was offered, but the whole was bought in at 4*d.* to 5*d.* per lb. for barrels, and 5½*d.* for tins. Ordinary Bermuda sold at 1*s.* 3*d.* per lb. We note further large arrivals of St. Vincents.

Camphor.—The German refiners have reduced the price of bells by 1*d.* per lb., now quoting 1*s.* 11*d.* in ton quantities. Tablets, on the other hand, have been advanced from 2*d.* to 5*d.* per lb., according to size. English refiners' prices are unchanged. Crude camphor is firm, but unchanged, at 145*s.* per cwt. c. i. f. for Formosan, and 165*s.* c. i. f. for pressed.

Cocaine.—Has been reduced 2*s*. 3*d*. per oz., makers now quoting *Hydrochloride* at 14*s*. per oz. for 200 oz. quantities; 14*s*. 3*d*. for 100 oz. lots, and 14*s*. 6*d*. for less than 100 oz. Pure is 2*s*. 3*d*. per oz. more. Four tins of crude (79.55 per cent. pure) were offered at the drug-auctions but withdrawn.

Gambir.—Small sales of Cubes have been made at 40*s*. per cwt.

Benzoin.—Very quiet and unchanged. Fairly good Sumatra Seconds, well packed, with small to medium almonds, sold at £7. 2*s*. 6*d*., and medium ditto at £6. 5*s*. per cwt. Of three cases Siam, one sold at £12. 10*s*. for pea and bean-size in friable block; 65*s*. was wanted for siftings in hard, dark block. For good glassy Palembang 40*s*. was wanted.

Cannabis Indica.—Is still obtainable at 2*s*. 6*d*. for tops, but it is reported that the price will soon be 3*s*.

Cardamoms.—The quantity shown to-day was heavy, and the demand being poor, especially for the finer quantities, prices declined from 2*d*. to 3*d*. per lb., although in some instances they were very irregular. The following rates were paid:—Ceylon-Mysore, extra fine bold pale smooth, 3*s*. 2*d*., bold split ditto, 2*s*. 5*d*. to 2*s*. 9*d*., medium split, 1*s*. 7*d*. to 1*s*. 10., small split, 1*s*. 2*d*. to 1*s*. 4*d*., medium and bold pale, 1*s*. 9*d*. to 1*s*. 10*d*, small and medium pale, 1*s*. 2*d*. to 1*s*. 5*d*., very small pale, 1*s*. 1*d*., brown splits and pickings, 1*s*. 1*d*. to 1*s*. 2*d*. Decorticated seeds sold at full prices, 1*s*. 9*d*. to 1*s*. 10*d*. per lb. being paid.

Coca-Leaves—Good greenish Ceylon leaves realised 1*s*. 2*d*. per lb. For 4 bales of sound greenish Truxillo leaves 8*d*. per lb. was paid.

Dragon's Blood.—Two cases of thin reed, of fair quality, sold at £8. 10*s*. per cwt., and for two other cases of lump, of medium colour, £9. was paid. For fine block run together £13. 10*s*. was wanted.

Galangal.—Is selling privately at 25*s*, which price was asked for the parcel offered.

Ipecacuanha.—In large supply and quite neglected, no sales being made publicly. For fair Cartagena-root 3*s*. 6*d*. per lb. was refused in one instance, the limit being 4*s*. Rio was held at from 9*s*. 6*d*. to 9*s*. 9*d*. per lb., the latter figure being asked for fine bold bright. Supplies of both descriptions are accumulating, and with the apparent increase in the production of "cultivated" Brazilian-root (36 bales of which were offered to-day), the market must gradually ease.

Kola.—Eleven bags bright washed West Indian realised 2½*d*. per lb. and the same figure was paid for a mouldy barrel.

Oil, Lemongrass.—The parcel offered had been sold privately; more was obtainable at 5*d*. per oz.

Oil, Lime.—West Indian distilled sold at 1*s*. 10*d*. per lb.

Spices.—Continue without animation. At auction on Wednesday washed rough *Cochin Ginger* was bought in at 39*s*. to 40*s*. per

cwt. and Calicut brown rough at 41*s.* to 42*s.*, bold cut at 80*s.* to 90*s*, and medium at 70*s.* Unassorted native cut partly sold at 60*s.* to 60*s.* 6*d.*, good tips at 43*s.*, small tips at 34*s.*, and good cuttings at 33*s.* per cwt. Rough limed Japan was bought in at 35*s.* Jamaica sold with good competition at steady prices. Zanzibar *Cloves* unchanged but slow; the nominal price remains at 3¾*d.* per lb. Ordinary stalky *Zanzibar Chillies* sold sold at 26*s.* per cwt. and Nyassaland at 46*s.* to 50*s.* for fine red picked, at 43*s.* to 45*s.* for good, and at 38*s.* to 40*s.* for rather mixed. Bright red Egyptian *Capsicums* sold at 40*s.* good Nyassaland at 28*s.* 6*d.*, and faded East India cherries at 17*s.* per cwt. common East India on stalk being bought in at 13*s.* per cwt. *Pimento* slow, but steady, fair to good being bought in at 3*d.* per lb. *Nutmegs* lower for small, but steady for bold. Mace firm, good pale Penang sold at 1*s.* 9*d.* per lb. *Cinnamon-chips* were bought in, the nominal value being 2¾*d.* per lb. There were no buyers for the parcels of *Cassia lignea* offered. *Black pepper* steady, but quiet, Singapore was bought in at 5½*d.* per lb., but near at hand can be bought at 5$\frac{7}{16}$*d.*, fine Tellicherry was bought in at 6*d.* Good Aleppy sold at 5¼*d.* and Calicut at 5⅜*d.* per lb. Penang white sold at 8½*d.* per lb., good Singapore, coriander kind, was bought in at 11*d.* per lb. The quotation for fair is 9¾*d.* per lb.

The Chemist and Druggist, July 12, 1902.

(*A*)

Export from Singapore and Penang to Europe and America.

For fortnight ending 31st July 1902.

Wired at 4.15 p.m. on 1st Aug. 1902.

					Tons Steamers.
To England:—					
Tin	from Singapore & Penang to England and U. K. optional any ports			-	1,300
Gambier	from Singapore		to London	-	10
,,	,,	,,	to Livepool	-	120
,,	,,	,,	to U. K. & / or Continent	-	320
,,	,,	,,	,, Glasgow	-	...
Cube Gambier	,,	,,	,, England	-	30
White Pepper	,,	,,	,, ,,	-	30
Black ,,	,,	,,	,, ,,	-	20
White ,,	,,	Penang	,, ,,	-	60
Black ,,	,,	,,	,, ,,	-	40
Pearl Sago	,,	Singapore	,, ,,	-	30
Sago Flour	,,	,,	,, London	-	400
,,	,,	,,	,, Liverpool	-	600
,,	,,	,,	,, Glasgow	-	...

			Tons Steamer.
Tapioca, Flake	from S'gapore & P'nang	to England -	290
,, Pearl & Bullets	,, ,,	,, ,, ,, -	300
,, Flour	,, Penang	,, ,, -	900
Gutta Percha	,, Singapore	,, ,, -	90
Pineapples	,, ,,	,, ,, cases	28,000
Copra	,, ,,	,, ,, -	50
To America :—			
Gambier	,, ,,	-	420
Cube Gambier	,, ,,	-	...
Black Pepper	,, ,,	-	160
,,	,, Penang	-	50
White Pepper	,, Singapore	-	20
,,	,, Penang	-	30
Nutmegs	,, Singapore & Penang	-	2
Tapioca, Flake & Pearl	,, ,, ,,	-	20
Pineapples	,, ,, ,,	cases	14,500
To the Continent :—			
Gambier	from Singapore	to South Continental Ports	20
,,	,, ,,	,, North ,, -	360
Black Pepper	,, ,,	,, South ,, -	140
,,	,, ,,	,, North ,, -	140
,,	,, Penang	,, South ,, -	50
,,	,, ,,	,, North ,, -	...
White Pepper	,, Singapore	,, South ,, -	30
,,	,, ,,	,, North ,, -	160
,,	,, Penang	,, South ,, -	40
,,	,, ,,	,, North ,, -	110
Copra	,, Singapore & Penang	to Marseilles -	1,250
,,	,, ,, ,,	,, Odessa -	300
,,	,, ,, ,,	,, South Continental Ports - other than Marseilles and Odessa.	440
,,	,, ,, ,,	to North Continental Ports	3,100
Tapioca Flake	,, ,, ,,	,, Continent -	130
Tapioca Pearl	,, ,, ,,	,, ,, -	420
Cube Gambier	,, ,, ,,	,, ,, -	70
Pineapples	,, ,,	,, ,, cases	2,500

N. B.—"South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,350 tons Gambier
200 ,, Black Pepper
(*in Singapore*)
contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th August, 1902.

Wired at 4 p. m. on 16th August, 1902.

	From	To	Tons Steamer.
To England:			
Tin	from Singapore & Penang	to England - and U. K. optional any ports	1,800
Gambier	from Singapore	to London -	180
"	" "	to Liverpool-	30
"	" "	to U. K. &/or Continent -	100
"	" "	to Glasgow -	...
Cube Gambier	" "	to England -	50
White Pepper	"	to " -	40
Black Pepper	" "	to " -	10
White Pepper	" Penang	to " -	...
Black Pepper	" "	to " -	20
Pearl Sago	" Singapore	to " -	90
Sago Flour	" "	to London -	1,000
"	" "	to Liverpool -	450
"	" "	to Glasgow -	120
Tapioca, Flake	" S'pore & P'nang	to England -	540
" Pearl & Bullets	" "	to " -	350
" Flour	from Penang	to " -	875
Gutta Percha	from Singapore	to England - -	110
Pineapples	" "	to " -	cases 23,500
Copra	" "	to " - -	50
To America:			
Gambier	" "	- -	100
Cube Gambier	" "	- -	40
Black Pepper	" "	- -	100
"	" Penang	- -	10
White Pepper	" Singapore	- -	...
"	" Penang	- -	...
Nutmegs	" Singapore and Penang	- -	5
Tapioca, Flake and Pearl	" "	" - -	90
Pineapples	" "	-	cases 750
To the Continent:			
Gambier	from Singapore	to South Continental Ports	100
"	" "	" North "	600
Black Pepper	" "	" South "	80
"	" "	" North "	60
"	" Penang	" South "	...
"	" "	" North "	20
White Pepper	" Singapore	" South "	20
"	" "	" North "	10
"	" Penang	" South "	...
"	" "	" North "	10

					Tons Steamer.
Copra	from	Singapore & Penang	to	Marseilles	400
,,	,,	,,	,,	Odessa	200
,,	,,	,,	,,	South Continental Ports other than Marseilles and Odessa.	50
,,	,,	,,	,,	North Continental Ports	920
Tapioca Flake	,,	,,	,,	Continent	230
Tapioca Pearl	,,	,,	,,	,,	260
Cube Gambier	,,	Singapore	to	Continent	20
Pineapples	,,	,,	,,	,,	cases 1,250

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,250 tons Gambier
410 ,, Black Pepper
(*in Singapore*)
contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for July, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall,	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum,	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·879	139·0	81·9	88·2	74·3	13·9	77·7	·861	74·9	72	S. E.	2·11	·60

K, K, Hospital Observatory,
Singapore, 16th August, 1902.

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S. S.

Penang.

Abstract of Meteorological Readings for July, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·884	152·3	81·2	90·1	73·9	16·2	75·9	·797	70·8	69	S.	2·30	0·63

Colonial Secretary's Office,
Penang, 7th August, 1902.

G. D. FREER,
Acting Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for July, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
General Hospital.	29·832	150·4	82·8	89·7	69·9	19·8	81·5	1·058	60·9	94	E.	4·91	1·95

Colonial Surgeon's Office,
Malacca, 1st August, 1902.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for July, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall.	Greatest Rainfall in 24 hours.
			Maximum.	Minimum.	Range.	Mean wet.	Vapour Tension.	Humidity.		
Taiping ...	153	83·57	94	70	24	77·41	·861	75	4·34	·95
Kuala Kangsar ...	...	81·57	93	70	23	76·16	·831	77	2·73	·87
Batu Gajah ...	160	81·86	92	70	22	76·83	·856	79	·81	·26
Gopeng ...	...	81·92	92	65	27	77·22	·871	80	4·52	1·37
Ipoh ...	...	81·95	93	70	23	77·41	·883	81	1·61	·85
Kampar ...	...	...	92	67	25	...	...	...	4·05	1·65
Teluk Anson ...	...	81·91	91	69	22	77·21	·871	80	3·01	2·15
Tapah ...	..	81·42	92	67	25	76·53	·847	79	3·18	·73
Parit Buntar ...	...	83·47	93	70	23	77·58	·867	75	3·55	1·50
Bagan Serai ...	...	82·58	92	69	23	76·54	·833	75	·86	·47
Selama ...	...	82·54	91	71	20	77·65	·883	79	9·14	2·28

STATE SURGEON'S OFFICE,
Taiping, 18th August, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for July 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·887	150·8	82·1	89·7	71·7	18·0	77·4	·851	74·4	78	Calm	2·98	2,10
Pudoh Gaol Hospital "	...	...	...	...	...	..	...	...	...	...	...	3·83	2·27
District Hospital "	...	...	...	...	...	...	...	...	...	...	...	3·19	90
" Klang	...	...	...	85·6	73·8	11·8	...	...	...	...	...	3·85	1·50
" Kuala Langat	...	...	...	86·1	73·6	12·5	...	...	...	...	...	2·70	1·10
" Kajang	...	...	...	86·5	75·3	11·2	...	...	...	...	...	5·67	1·70
" Kuala Selangor	...	...	...	86·0	75·9	10.1	...	...	...	...	...	3·02	0·67
" Kuala Kubu	...	...	...	92.8	71·4	21·4	...	...	...	...	...	4·03	1·40
" Serendah	...	...	...	88·6	75·7	12·9	...	...	...	...	...	3·71	2.07
" Rawang	...	...	...	86·4	73·5	12·9	...	...	...	...	...	1·93	1,12
" Jeram	...	...	...	...	...	...	...	...	...	...	...	5·93	2·05

State Surgeon's Office,
Kuala Lumpur, 14th *August*, *1902*.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for July, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, District H'pital	...	...	...	92·	70·	16·	...	...	...	...	...	3·34	·87
Kuala Lipis	...	...	82·2	95·0	69·5	25·5	...	...	...	...	...	1·01	0·40
Raub	...	...	81·4	94·0	68·0	19·8	...	...	...	...	...	5·70	2·34
Bentong	...	...	78·2	92·5	64·0	28·5	...	...	...	...	...	2·92	1·56
Kuantan	...	...	...	87·	73·	14·	...	...	...	...	...	2·20	1·32
Temerloh	...	...	...	94·	71·	23·	...	...	...	...	...	4·58	1·24

Pahang, 5th August, 1902.

D. H. McCLOSKY,
District Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for July, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	83·3	91·3	70·7	20·6	76·6	...	...	...	S. W.	6·68	2·48

Muar, 2nd August, 1902.

FRANCIS PEARS.

No. 12.] OCTOBER, 1902.] [VOL. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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SINGAPORE:
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NOTICE.

The Scientific and Technical Departments of the Imperial Institute.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F. L. S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 12.] OCTOBER, 1902. [VOL. 1.

FRUITS OF THE MALAY PENINSULA,—*Continued.*

ROSACEÆ.

The Apple, Pear, Blackberry, Strawberry and Loquat have all been tried in the Straits, and most of them grow moderately well, and flowered. None except the Apple have produced fruit worth eating. A few Apples have been grown on Penang Hill, at an altitude of about 2,000 feet, but the amount of fruit produced does not offer any encouragement to gardeners.

Rubus moluccanus, the common wild raspberry of our open country, produces fruit consisting of a very few orange coloured flavourless drupelets and is not worth eating.

R. rosaefolius not rare in the hill districts with white flowers, and good sized red fruit is more worth attention. The fruit resembles that of an ordinary raspberry but is taller in proportion to its breadth, the flavour is very inferior to a cultivated raspberry, but it is well worth growing and eating. It will grow in the plains as well as the hills, and is raised from seed. The fruit is good either raw or made into a tart.

R. lasiocarpus, Sm., has been cultivated successfully on Penang Hill. It is a handsome plant with silvery grey stems, leaves white underneath, and large purple fruit. It is propagated by layers. The fruit is abundantly produced and is quite worth eating. In India whence it was obtained, FIRMINGER describes it as similar in flavour to the common English Blackberry but vastly superior and says that by judicious cultivation it might be rendered very productive. It might well be cultivated in our hill districts.

Parinarium nitidum, Hook. fil. A medium sized tree scattered over the Peninsula and abundant in Penang, bears small round sweet drupes which are eaten by natives and children, but are too small to be worth eating.

Chrysobalanus Icaco. The Coco-plum of South America, is a large shrub of rapid growth which has long been cultivated in Singapore. The fruit is globular about an inch through rose pink with a bloom like that of a plum on it. The flesh is abundant and white rather pithy, and slightly sweet and astringent, otherwise tasteless. It is a pretty fruit but not worth eating.

COMBRETACEÆ.

The seed of *Terminalia Catappa*, the Ketapang, sometimes called the Singapore almond is occasionally eaten. The tree is a common seashore tree and is often planted along roadsides.

MYRTACEÆ.

The Guava, *Psidium Guava* is cultivated very commonly all over the Peninsula. It is a large hardwooded shrub, of fairly rapid growth. The fruit in the Straits is rather hard, and does not seem ever to get so soft as it does in its native home of South America. There are two varieties grown here one with white flesh, the other pink. The latter is I think the best form.

The shrub is grown from seed, and seems to thrive in almost any soil unless very damp or stiff clay.

The fruit can be eaten raw but is more often cooked and used either in the form of Guava jelly or Guava cheese, or stewed for tarts which are excellent. The local variety is considered by Mrs. GUNN who constantly makes these preserves to be of much superior flavour to the Indian variety. The supply in Singapore is however very short, and it is not procurable in sufficient quantity.

Psidium acre, is a similar shrub with smaller round fruit which are much more soft and juicy when ripe, and very pleasant to eat. It has long been cultivated in the Botanic Gardens in Singapore, but is not plentiful, and has hardly been taken up by any cultivators,

Rhodomyrtus tomentosa. The Kamunting is a very common shrub all over our open ground in all parts of the Peninsula. It is about 5 feet tall with conspicuous white or pink flowers, and small fruits about half an inch long of a purplish colour, sweet and with a distinct flavour of raspberries. In Southern India the fruit is collected and made into jam which is said to be excellent. Here the difference of climate makes a considerable difference to the value of the fruit, for abundant as it is and readily as it fruits, the dampness and heat of the climate causes it to flower and fruit steadily all the year round, instead of fruiting all at once so that each bush at any given time has usually but half a dozen fruits at most ripe, so that it is very difficult to get a large enough quantity together to make jam.

Eugenia. In this very large genus scattered all over the warmer parts of the world a considerable number of the species have fruits more or less eatable though few if any in any part of the world can be considered as first class fruits.

The best known in the East are those belonging to the section Jambosa, and commonly known to the Malays as Jambu.

E. Malaccensis. L., (Malay apple), Jambu Bol, is a fairsized tree with large leaves, and beautiful crimson flowers borne on the branches. The fruit is about as big as a hen's egg somewhat pear shaped or oblong narrowed at the base, white, often splashed with crimson or entirely crimson, with white flesh and a single round seed. The fruit has been described as better than a turnip, but not so good as an ordinary apple. And indeed though eatable, it has very little flavour, It can be eaten raw, and also cooked stewed,

with cream or in tarts. I have also eaten it as a preserve stewed in syrup, and coloured red with Hibiscus flowers.

The tree is readily grown from seed and is worth cultivating. It is liable to attacks from *Coccidæ*, and the leaves especially in weak trees are often covered with galls.

E. jambos, L., Jambu Kelampok, is a smaller tree of more straggling habit with narrower lanceolate leaves and large white flowers borne on the ends of the branches. It is commonly cultivated. The fruit is the largest of all the cultivated Eugenias. Like the Jambu bol it is rather flavourless and dry, but greenish white in colour. "Near Calcutta the fruiting branches are covered with a cloth which is believed to improve the size and flavour of the fruit. A preserve is sometimes made of the fruit." (Watt's Dict.)

E. Javanica, Lam., is a very big tree with smaller rounded fruits green or white, with us rather dry, but eaten by all classes of people in India and said to be juicy and refreshing though almost tasteless.

E. aquea, Burm., Jambu Ayer Mawar, Rose apple is a large or medium sized shrub with white flowers on the ends of the branches. The fruits are very pretty, turbinate about an inch across the top, white, pink, or dark rose colour and translucent. The flesh soft and watery with a slight rose flavour.

The shrub fruits in May, and the fruit is very popular with natives, and also used by Europeans.

E. zeylanica, Wight, is a common sea-shore shrub with small white fruits produced in considerable abundance. The fruits about as large as peas, are pithy and dry but with an aromatic pleasant taste.

E. uniflora. A native of South America, is a large shrub with small leaves and white flowers, the fruit of which is about an inch across flattened at the top and grooved down the sides, and of a bright red, somewhat suggesting a small tomato. The fruit is soft sweet and with a somewhat turpentiney taste, when quite ripe its flavour more resembles that of a strawberry than anything else. It grows readily from seed and though not a heavy fruiter is well worth growing. In Brazil it is often grown as a hedge or alley plant in gardens.

E. Braziliensis. Said to possess an excellent eating fruit, has been for some years cultivated in the Botanic Gardens, but though it has flowered has not fruited yet.

The Brazil-nut, *Bertholletia excelsa* a large tree has been cultivated in the Botanic Gardens since 1884, but only flowered and fruited for the first time in 1897, when it produced one or two of its large capsules containg the seeds known as Brazil-nuts, since then it has fruited occasionally nearly every year.

MELASTOMACEÆ.

Contain hardly any eatable fruits. Those of the Senduduk, absurdly called the Singapore Rhododendron, *Melastoma polyanthum*, are sweet but rather dry, they stain the mouth black whence the name of the order.

Memecylon edule. A shrub with blue flowers and small drupes, is common about our coasts. The fruit is eatable but hardly worth gathering.

LYTHRACEÆ.

Sonneratia alba. "Perupat" is a very abundant tree along our sea coast, often growing in the sea itself, it has a round fruit flattened at the top about an inch and a half across.

The fruit is eaten by natives and when quite ripe is not unpleasant reminding one of a medlar.

Pomegranate, *Punica Granatum* L., is often grown in gardens in the Straits. It seems to prefer rather sandy soil. The fruit here is small and poor, and indeed the plant seems to be more cultivated for its flowers and the medicinal properties of its roots than for its fruits.

SAMYDACEÆ.

The chief genus of this order is *Casearia,* a number of shrubs or small trees of which the seeds are inclosed in a red eatable pulp One of them is known as *Casearia esculenta,* but though the pulps is eatable it is certainly not worth the trouble of eating.

PASSIFLOREÆ.

The climbing passion-flowers (*Passiflora*) have often fruit which is eatable, and in some cases really excellent. Of these the best are *Passiflora quadrangularis* and *P. laurifolia.*

The first of these the Grenadilla, has large green fruits 6 inches long with a thick rind and a good deal of pulp of a very pleasant flavour round the seeds. It is eaten raw and the rind is sometimes preserved in sugar as a sweetmeat. The Sweet cup *Passiflora laurifolia* is much smaller, about the size of a hen's egg, orange yellow in colour. The rind is thin and not used as preserve. This is the best fruit of the two, and the most popular.

The passion flowers grow readily from seed or cuttings and can be let to climb on a trellis or on low trees. They grow rapidly and fruit well, especially the Sweet-cup, but are often plundered by civet cats, monkeys and bats.

The Papaya (*Carica papaya*) is a native of South America but has been cultivated all over the tropics for many years. The tree is raised from seed, and is of very rapid growth. It prefers rich rather damp soil, but will thrive in almost any soil, except very stiff clay or very wet spots. It is unisexual. The flowers in the female tree being on short pedicles on the upper part of the stem. Those of the male being in long pendent racemes. Hermaphrodite flowers often occur on the male inflorescence and produce small abortive fruits. The flowers are fertilized by night moths usually hawk-moths.

The Papaya fruits almost all the year, and is one of the best and most wholesome of our fruits. In sub-tropical parts of the world, the fruits have a strong coarse flavour of nasturtiums, but those of the Straits and other places near the tropics have barely a taste of this and are often as good as a melon. Though so extensively

planted there are but few varieties, the most striking one being a very large fruit about 18 inches long. This which is said to be a Ceylon variety, is somewhat inferior in flavour to the smaller kinds, but is notwithstanding a very fine fruit. A good papaya should be dull green in colour and tolerably firm in the flesh which should be of a full orange colour. In some fruit the flesh is soft and watery, and there is an excess of the milky latex.

The young fruit cooked makes an excellent vegetable, resembling vegetable marrows.

The Mountain Papaya, *Carica cundimarcensis* has been from time to time introduced into the Straits. It will not grow in the plains, and I have not heard of its fruiting in the hills.

CUCURBITACEÆ.

The Rock melons are very difficult to grow here on account of the dampness of the climate. They grow well up to a certain point and then drop off their stalks which rot through before they are ripe. However Mrs. KYNNERSLEY formerly succeeded in fruiting some small melons, at Malacca, and which were of good flavour, were very small in size. In the dryer parts of the peninsula it is possible that some success might be had with these, but the absence of a dry season in which the fruit can ripen mulitates much against the success of their cultivation.

Some good sized fruits of *Cucumis Melo var momordica* were lately grown successfully in the Botanic Gardens, it is quite an eatable melon though rather poor in flavour, I had some cooked also as a vegetable and found it palatable. The ripe fruit is cylindric, mottled dark and light green from 1 to 2 feet long, and 3 to 6 inches through, weight 4 to 10 pounds.

The water melon, *Citrullus vulgaris* is easily grown here, and not rarely to be seen in Chinese Gardens but it might be more extensively cultivated. There are a considerable number of varieties especially in America which might well be worth introducing.

The musk melon, is often cultivated. It is an oblong white melon rather pithy in texture and with a distinct taste of musk. It is a poor thing as a fruit.

The melons are all raised from seed, and require good rich soil, and are except in the case of the water melon, best grown on a trellis, and well supported. They are very liable to attacks of insects. The crickets and grass hoppers eat down the seedlings, small beetles attack the leaves and various insects attack the fruit itself. The fruit however may be protected in this case by enclosing them in a piece of musquito curtain. Iron in the soil is said to be fatal to melons, though some forms certainly grow fairly well in our soil here which is very rich in iron.

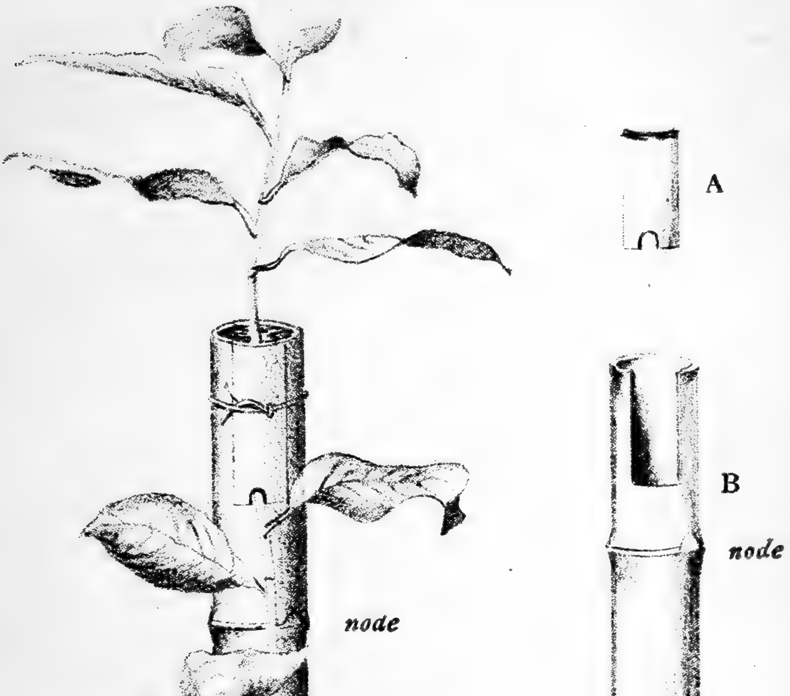
THE IMPROVED METHOD OF MARCOTTAGE.

The method of propagating plants now pretty generally known to gardeners and planters as Marcottage, or in Malay countries by the Malay name of "Balut", which seems to be the more desirable

word to adopt, is for many hardwooded trees and shrubs the most simple and certain of all methods of propagation, and in some cases the only one.

There are very few trees that are not amenable to this manner of propagation if done under favourable weather conditions. As an example I may mention that in May last I saw in the forest plantation in Selangor a number of Casuarinas "Kayu Ru" that had been successfully Marcotted. The object aimed at is of course course the production of roots at a given point of the branch or stem before severing it from the parent plant. This done by, in most cases, removing a ring of bark or in cutting partly through the branch and then wrapping around this particular part some moisture retaining material which should never be allowed to get absolutely dry. And therein lies the difficulty to the case of plants that take some months to produce roots by this method.

To attach a sufficiently large quantity of material to hold moisture for a considerable time is often an awkward business and when done the weight, unless the branch is a particularly stout one or supported with props, bends the top over so that by the time it is rooted it is an unshapely specimen. In dry weather frequent watering is necessary, and if the more or less rounded mass of material once becomes thoroughly dry it takes a great deal of watering before it again becomes saturated through. To lessen these difficulties we have hit on a plan of using bamboo stakes and for plants that are of a suitable height and size it is found to be an improvement in several respects on the old method of tying balls of coconut fibre, moss clay, or any other material. The accompanying illustration will show more clearly than any written description the manner in which the bamboo is cut and used. This method has several advantages not the least being its capacity, if set in an upright position, of catching all the rain that falls within the radius of the opening of the bamboo and greater facility and economy in watering in dry weather. Evaporation is much less rapid and the shoot having been kept in an upright position during the time it has been forming roots is a much more shapely plant when severed from the parent. The larger the bamboo used the better as the greater the quantity of material, whether moss, coconut fibre, leaf-mould, or clay, the less frequent will watering be necessary, and the quantity is often of more importance than the quality, the important point being to prevent its becoming alternately wet and dry. By cutting out the slit (*A*) about one and-a-half or two inches above the node (joint) as shown in the illustration moisture is retained in the lower portion and yet not in a position to cause the soil at the rooting point to become sodden. When bamboos are easily obtainable the work can be very quickly and cheaply done. The saw is drawn across at (*B*) and with a parang or hatchet the door or opening is slit out in an instant. If the branch is stout a little notch either in the door or the stake, or both, is necessary, but in the case of thin shoots it does not much matter. The slit when replaced is kept in position by tying it with a piece of rotan or fine wire. The wettest season of the year should be


A
B
node
node

chosen for this method of propagation, but it can be done at any time provided proper attention is paid to watering, but if this is neglected and the soil is wet one day and dust dry the next, the result will necessarily be unsatisfactory.

C. CURTIS.

AGRICULTURAL SHOWS.

It is now some years since Agricultural and Horticultural shows first began to be held in various parts of the Straits Settlements and the Malay Peninsula. The first Horticultural exhibition was held at Singapore in 1881 , and for a succession of years this was an annual event interupted at intervals when as often happens in the East the public interest temporarily ceases. Later exhibitions which included agricultural produce were held in Malacca, Penang and the Federated States. Most of these exhibitions were open to any part of the Peninsula as well as the district in which they were held, but the exhibits from outside were usually very scanty. This was in part due doubtless to the difficulty of transport of the specimens, and also to the paucity of planters and others sufficiently interested in agriculture. Matters are very different now however, and it seems quite time that our shows should be put on a much higher footing.

Mr. CURTIS has put together a number of suggestions for doing this, which I publish with this letter hoping that planters and all other readers of the Bulletin, will contribute opinions and criticisms on the subject.

It will be seen by the classification of exhibits that the shows will offer chances both for natives and for European planters. It has been said that Malays look on the shows as an amusement and learn nothing from them. This may be true in the case of a considerable number, but we must remember that any ideas of improvement in cultivation come slowly to the Malays, and that that there are a certain number who will always be interested in new products, and attempt their cultivation and if they are successfull others will imitate them. The shows also as regards the Malays should be of assistance in restoring the lost or disappearing arts of the natives, and although artistic work hardly comes within the scope of an Agricultural journal, yet it is worth pointing out that the addition of artistic exhibits in a show adds a great attraction and stimulates the artistic instinct lying dormant in many natives for want of competition. The Chinese are more quick to learn from shows, both of produce and tools. Indeed there is no better way of improving the implements of cultivation than by exhibiting them for competition. The machinery and tools used by natives and indeed often by Europeans are of the simplest nature, and though the agriculturists would use labour saving appliances if they saw them in use, they ordinarily have so little chance of seeing them that they are naturally doubtful of them. A good deal remains to be done in the introduction of new appliances, and indeed of many old ones as

well, and we may hope that firms that import and invent agricultural tools may exhibit many new and useful appliances at future agricultural shows.

The introduction of papers and discussions at the various shows is another improvement which may produce the most valuable results. These conferences in other parts of the world have been remarkably successful, and are now quite an important feature in all large meetings. This would necessitate the exhibitions being kept open longer than usual and add to a certain extent to the expenses but I think it would be well worth it. The question of expense is one of some importance, as it would undoubtedly vary in the different localities in which the show was held. The Government would probably be prepared to assist materially but local subscriptions and gate money are very variable in different places. In past shows in Singapore, for example, at times there would be a good surplus devoted to the next year's show, at others a deficit but I think we may fairly hope that many interested in the development of agriculture would send regular subscriptions to the shows even if they were personally unable to be present. In any case the Committees will want the support and interest of the whole planting community and should they obtain that there is no reason why the agricultural exhibitions of the whole Peninsula should not rank with those of other Colonies.

AGRICULTURAL SHOWS.

Experience has proved that no one of the Settlements or Native States is equal to maintaining an annual Agricultural Show or Exhibition on sufficiently comprehensive lines to be of great educational value, and as healthy competition can only be induced by holding those Shows at regular intervals, the time and place being made known a considerable time in advance. My idea is that one good Show might be held every year by combining forces and taking in rotation one of the five principal towns in the Colony and Federated Malay States, *viz.* Singapore, Penang, Malacca, Taiping, (or Ipoh) and Kwala Lumpor. There is however no reason why other places in the Federated Malay States should not be included later if the local authorities are desirous, and willing to guarantee a sufficient sum towards the expenses.

The first step towards the carrying out of this scheme is in my opinion the formation of an Agricultural Committee consisting of say three persons in each of the places in which it is proposed to hold these shows.

This Committee should be nominated by H. E. The Governor and be a standing one. In the years in which the meeting is not being held in the Settlement or State for which they are nominated the members of this Committee will act as Agents in disseminating information, prize lists, &c., and in collecting and forwarding exhibits to the Settlement or State in which the Show is being held, and if possible be present at the Show. The three in the Settle-

ment or State in which it is decided to hold the Show will of course undertake the organisation of local Committees and sub-Committees for the raising of subscriptions providing necessary buildings and all other arrangements in the same way as has hitherto been done.

The standing Committee should, I think, decide on the order and the date on which the shows should be held and supervise the preparation and issue of prize lists.

For the first time the determination of the place in which the Show is to be held could probably be done by correspondence, but at the first meeting, and at all subsequent meetings, arrangements should be made for the ensuing year.

Some alteration as regards the period during which past Shows have been kept open is absolutely necessary. Two days is inadequate and as the expenses are very little more for four days than two, I suggest four. This will allow of the judging being done in a more satisfactory manner and afford opportunities for all classes of the community to examine at greater leisure the articles that are brought together. It would also afford time for the reading of papers, and discussions on subjects affecting agriculture somewhat on the lines of the Agricultural Conferences in the West Indies, and I think no better time could be chosen for this purpose.

Exhibits might be classed under the following heads which would practically cover the ground:—

I:—Agriculture—Life Stock—Produce &c.
II:—Horticulture—Fruits—Vegetables—Flowers.
III:—Manufactures—Native and others.
IV:—Works of Art—Pottery—Pictures &c.

With a substantial Government Grant, supplemented by local subscriptions and gate-money, there should be no difficulty in raising funds and in getting together a good collection, of educational value.

The cost of transport would in the majority of cases be paid by the Committee, but this is not a serious item as the Steam-Ship Companies and Railways will no doubt undertake the carriage of exhibits at nominal rates. Trade exhibits such as machinery &c., would of course be paid for by the exhibitor. Important points are that the date of these shows should be fixed at least a year in advance, and prize lists issued at least nine months before the date of the Show. It should also be well advertised and kept before the public by means of the Bulletin and local papers.

This is roughly an outline of the ideas I had in my mind when writing the letter to which you refer.

C. CURTIS.

RAMIE, RHEA, CHINA GRASS.

A short letter appeared over my signature in Bulletin No. 10 on this subject. My experience in the production of Ramie "ribbons" is well known to the members of the U. P. A. since with the aid of H. E. the Governor, we exposed the wiles of a broker who was

using the Imperial Institute and Colonial Office for advertising purposes.

This production of "China Grass" by the Faure process as recommended by Messrs: JULES KARPLES & Co., is quite another matter "China Grass" has an established market, though a very small one and M. FAURE makes no rash promises concerning it. I purchased a FAURE machine on the English Agents published assurance that "under ordinary circumstances a production varying from 100 to 200 lbs. of dry fibre in ten hours per machine my be expected" I never succeeded in getting more than 4 lbs. per hour from my machine but then, I only obtained 2½ per cent. of fibre against the weight of green stems, whereas the agent expected about 5 per cent. When I visited the inventor at Limoges, he told me that his average was 3 per cent., and that his English agent had also overestimated the capacity of the machine. He confirmed these statements in writing. Both M. FAURE and his agent advised me to visit Mr. BLUNTSCHLI, who was working a number of Faure machines in Sumatra I took their advice, but when I arrived at Siak I found that Mr. BLUNTSCHLI was getting no better results than I was, either in the percentage of fibre or in the gross weight of stems treated. The best offer received for my fibre was £17 per ton which would nearly all be absorbed by factory expenses and freight. Mr. CURTIS observes that 4 square yards at Kew yield 100 stems. I have obtained this number from one plant in a single cutting and I can get six cuttings per annum; but the more I obtained, the poorer I should be, with the price at £17 for 2½ per cent. of the gross weight treated. Of Black Ramie (ribbons) I can get from 5 to 7 per cent. with my Eke machine. This I could sell profitably at £17 per ton in Europe but no one seems to want it regularly and the last three bales I sent were left at the Liverpool Refuse Destructor, to save storage!

To return to the Faure machine I improved in quality with experience and I daresay that I could get a higher quotation now; but to what end? The Chinese supply the demand and if I extended my cultivation up to a thousand acres I should spoil their market without benefit to myself.

What are the probabilities of the market's expansion with an increased supply.

The Kew Bulletin, which Mr. CURTIS quotes, says that ;filasse must be produced at 4d. per pound. Sir WILLIAM THISELTON DYER, the Director, has since repeated this to me, personally, and I have often heard this figure quoted amongst the directors of the more or less amateur companies which at present play at spinning ramie.

These good folks, usually doctors, lawyers and poverty stricken peers show all sorts of beautiful samples of fancy goods, and at the same time blandly talk about getting their raw material at half the average price of Long Island Cotton. Many a time have I been shewn a piece of table linen and been called upon to observe its vast superiority to the rubbishy produce of the flax spinner as used in my own home.

Perhaps it was, but when they proceeded to say that all they need in order to beat the flax spinner in his own field is that I should produce them filasse at one third the price which the latter pays to the Irish farmer for the produce of his retting pit, I am constrained to think that my spinning friend hardly admires his piece of linen as much as he would have me do.

We are told that with an increased supply will come an increased demand. At present the manufacture is in an experimental stage, so far as the United Kingdom is concerned, and China supplies a sufficiency of hand treated grass for experimental purposes. This being so it is passing strange that nearly every article written about ramie urges planters to cultivate it. What we require are a few practised spinners who are willing to buy it.

CYRIL E. S. BAXENDALE.
Jugra Estate, Selangor.

RUBBER IN MADRAS.

The following notes are taken from the Government Botanic Gardens Annual Administration report for the Nilgiris 1901-1902, of Para rubber planted November, 1898, the best tree measured on March 22, 1901, and again March 6, 1902, gave a height of 18 feet 8, and 21 feet 9 inches, and girth at four feet from the ground on the second occasion $8\frac{1}{8}$ inch. The tallest tree in the plantation of the same age was 29 feet, with a girth of $6\frac{5}{8}$ at four feet height. These trees gave a good quality of rubber though too young to be tapped profitably.

Castilloa raised from seed collected in April, 1897, planted out September, 1898, flowered March, 1902. But they only give at present a gummy substance destitute of the properties of true rubber. The best measured in March 22, 1901, gave a height of 12 feet, and on March 6, 1902, 18 feet 10 with a girth of 1 foot $5\frac{1}{8}$ inches at four feet from the ground.

A Castilloa in Wynaad girthing 3 feet 3 inches at $2\frac{1}{2}$ feet from the ground yielded 14 ounces dry rubber at one tapping.

A Mr. PARSONS of South Coorg writes to the Curator of the Gardens stating that he possesses a Ceara rubber tree 20 years old that gives 10 lbs. rubber a year, but he has no other trees which give nearly as much and some give next to no latex.

BRAZILIAN RUBBER TRADE.

The following is from the "Brazilian Review":—In his report of Junuary 13, the U. S. Consul at Pará says, with regard to Rubber shipments from the Amazon valley for 1901 shows a steady increase over the business of 1900, the total gain being 3,255 tons, of which the increase to Europe was 500 tons and to the United States 2,755 tons. In other words Europe took

14,254 tons of rubber from the Amazon in 1900 and the United States 12,621 tons during the same time; but during 1901, Europe took but 14,755 tons and the United States took 15,376 tons.

Another significant feature shown by these statistics is the enormous growth of the rubber trade at Manaos, amounting to almost 100 per cent. During the year 1900, there were shipped from Manaos a total of 8,012 tons of rubber, and 18,467 tons from Para. During the year just closed however, Manaos shipped 15,469 tons and Para but 13,639 tons. This change was caused by the passage of a law in January, 1900, enacting that thereafter all rubber extracted in the State of Amazonas, and all other products of that State, should be shipped direct from Manaos. A large portion of this rubber had formerly been sent from Para.

Another feature of these statistics is the large increase in shipments from Iquitos. During the year 1900, Iquitos shipped 920 tons of rubber direct, and in 1901, 1,391 tons, a gain of more than 50 per cent. Next year will probably witness a still greater gain, and within a few years the Upper Amazon and its affluents may produce as much rubber as the lower river.

Exports from Para and Manaos in 1901.

	Europe. Tons.	U. S. Tons.	Total. Tons.
Pará - -	14,755	15,376	30,131
Manáos - -	7,336	8,133	15,469
	Total -		- 45,600

COFFEE-BEAN HUSKS AND MALARIA.

The following copied from the "Chemist and Druggist" of August 23rd, 1902, might well be experimented on estate coolies by Coffee planters:—

Dr. L. RESTREPO, of Medellin, has reported through the Channel of the British Legation, Bogota, Columbia, that he has found the husk of the coffee-bean useful in malarial fever, as also in influenza and chronic dysentry. His prescription is:—

Coffee husk	..	30 grams.
Water ...	...	400 ,,

Boil for 5 minutes; strain.

A small cupful six times a day.

Malarial cases are said to have recovered through this treatment without complication and with freedom from the prostration which usually accompanies attacks. Preparations of unroasted coffee have long been used in malaria, notably by the Dutch in their East Indian possessions, but the therapeutic use of the husk is a new suggestion. Dr. RESTREPO is anxious that analysis of the husk should be undertaken in order, if possible, to discover to what principle it owes the medicinal properties he describes.

PARA RUBBER.

The Penang Gardens rubber tree, figured in the August number of this Bulletin, has now been tapped for the seventh time and the result is 2 lb. $13\frac{1}{4}$oz. of dry rubber which makes a total of 18lb. 7 oz. in seven years. If this can be maintained, and I see no reason why it should not be as the tree has at no time been excessively tapped, the yield of latex in fact being almost as good when tapping ceased as at any period of the tapping and much better than at the beginning, the financial result of a rubber plantation on which the trees are as good as this, and I have heard of some a good deal better, cannot be questioned. The method followed during the whole period of tapping this tree from June 1897 to September 1902 has been the same throughout, but other methods have been tried in a more or less perfunctory manner on some smaller trees and I consider this the best; so at the risk of repeating what many readers of the Bulletin have already read in the Annual Reports on the Botanic Gardens I will briefly describe the system. A small perpendicular channel a foot or more in length and about one eighth of an inch broad, but not deep enough to obtain much rubber, is first made, and at the base of this is affixed the tin or other receptacle to receive the latex. This channel is not subsequently enlarged or interfered with its purpose being merely to conduct the latex to the tin. Leading to this channel diagonally are made two or three incisions on either side which supply the latex and from the upper surface of which a thin shaving is removed every morning or every alternate morning which causes a fresh flow of latex. In each of these tappings a thin shaving has been removed thirteen times which with the initial opening of the cuts make fourteen operations and constitute what I term one tapping. It will thus be seen that the number of times this tree has actually been operated on amount to seven times fourteen, that is ninety-eight, and the average amount of dry rubber obtained from each operation is about three ounces. The daily amount however varies very much, the yield at the beginning, during the first two or three operations, being so little that any one not acquainted with the nature of this tree and who has been accustomed to tap "Rambong" or other native rubbers in which the greatest flow of latex is at the first operation would naturally be disappointed. I have before me the figures showing the amount of the daily collections of three tappings weighed while still wet with the water pressed out by hand, and the first seven operations gave $94\frac{1}{2}$ oz. while the second seven gave 210 oz. or a total of 303 oz. This when dried gave 156 oz. or a loss of about 50 per cent. and as I have already stated in one of my annual reports this proportion of loss in drying may be taken for all practical purposes as a basis of calculation by planters. As it is advisable to put some water in the tins to prevent too rapid coagulation there will be a little variation but for all practical purposes the calculation is sufficiently correct. The latest tapping was not weighed in the wet state but each day's collection was marked and weighed separately when dry, and the result as regards the increase

in yield after two or three operations is much the same as on previous occasions $15\frac{3}{4}$ oz. represent the first seven days collections and $29\frac{1}{2}$ oz. the second seven; the greatest quantity at one operation being the twelveth morning when $5\frac{3}{4}$ oz. were collected, and the least on the first two mornings which gave respectively 1 oz. and $1\frac{1}{4}$ oz.

Whether tapping should be done every day or every alternate day is perhaps a question that cannot be definitely decided with the limited experience we have gained in tapping, but I am decidedly of opinion that alternate days are preferable, and that the latex becomes more watery when the tapping is continued daily. As regards the best season for tapping there appears to be no reason why it should not be done at any time except in excessively dry weather when the latex certainly does not run as freely as in wet weather, and dull cloudy days appear to be favourable to the flow of latex.

By the method of tapping described, although it appears to me to be the best I have seen, a great deal of rubber is lost in and attached to the slices of bark that are removed at each operation, and the less expert the operater the greater the loss. During the tapping just now completed the overseer who performed the work saved all these chips and by boiling and pounding in a mortar removed most of the woody matter and produced a ball weighing half a pound, but not quite dry, that looks not unlike a very poor dirty sample of Rambong as sometimes seen in the market When operations come to be carried out on a large scale I suspect that this will be worth considering for although discoloured and containing a proportion of woody matter there is no doubt it will find a market at a price. A very neat little tool for tapping was recently sent me for trial by Mr. R. S. MEIKLE which effects a great saving in labour especially in opening the cuts on the first commencement of operations but whether it is as good as a chisel for subsequent operations or for old trees is doubtful. My man discarded it in favour of the carpenter's chisel with which he thought be obtained a better flow of latex and after trying it myself I came to the same conclusion and the reason is that such a tool cannot be kept with such a fine edge as a chisel. Any scratching or bruising of the surface of the cuts must be avoided. The sharper the implement used the better the flow and the less loss by coagulation in the cuts. The objection to the chisel is that it does not remove the shaving unless the cut is made very deep.

C. CURTIS,

15th November, 1902.

IRELAND'S INDIA RUBBER PEAT.

Ireland may turn out to be a veritable Klondyke in a few years. The latest scientific discovery is a method of manufacturing artificial gutta-percha from peat, and if it turns out to be what is

claimed, it will simplify a great problem in electricity, the insulation of ocean-cables.

A scientist who discovered the method asserts that he is able to make an equally-good insulator out of ordinary peat.

So far, gutta-percha is the only substance which has been found to furnish perfect protection for a wire against the chemical influences of salt water, and the product is not only limited, but is practically controlled by a few manufacturers, who own the forests in the East Indies from which gutta-percha is obtained.

The price of gutta-percha has been gradually increasing for years owing to the enormous demand, and the supply is diminishing; so that if the scientist's discovery proves successful he will contribute greatly to the world's economy.

In Ireland there are 3,000,000 acres of bogland which are at present useless, while in Scotland 2,500,000 acres will be at the inventor's disposal.—*Central African Times.*

RUBBER PLANTING IN COSTA RICA.

To the Editor of the

TROPICAL AGRICULTURIST, COLOMBO, CEYLON.

Dear Sir,—

As far back as January last I promised to write you an article on Rubber-p'anting in the San Carlos Valley, and intended at that time to have made a trip over there and to furnish some newer information and experiences acquired personally. This I have not been able to do; when we got through with the handling of the past coffee-crop about the middle of March, I was taken with acute neuralgia in the head and from this I am still suffering. I had, therefore, to avoid myself of the kindness of Mr. ALFRED LONG, an American, who is settled in the San Carlos valley on quite a large scale, for most of the information that follows. Mr. LONG returned a few days ago, after spending about two weeks, visiting the more settled parts of the valley.

Mr. THEODORE KOSCHNEY, well-known to you and to the readers of the *Tropical Agriculturist,* is without doubt the oldest living of foreign settlers in the San Carlos Valley, as well as the most practical of Rubber planters, his experience running back over some 25 years in the district. Strange to say that, though at all times interested in Rubber for the purposes of trade, his own plantation should consist of Rubber trees not over two years old, which he has planted and kept up in a way dictated to him by his own observations, and all his plantation is so far of very good promise.

Mr. KOSCHNEY'S method of planting calls for the preparation of a seed bed six or eight months previous to planting, and as handy as possible to the plantation, and the felling of the virgin forest to admit of a liberal amount of sunshine on the ground, leaving it under what his termed "light shade." This felling is quite a matter of judgment with the planter, and he varies it according to the

kind of timber and the dryness or humidity of the soil, these being the principal things to consider. At the time of planting the six-or-eight-month seedling is between 18 and 30 inches high; and though some have planted the seeds themselves 2 or 3 to each stake there is nearly always a heavy loss from the small lizards or chirbalas, and re-planting never ends. A cleaning is given to the young Rubber about three months after planting. This is not more than a rough chop-down 4 or 5 feet on each side of the rows of plants (which are set about 18 or 20 feet apart both ways) and is repeated 5 or 6 months later, and kept on pretty much in this manner once or twice a year to ensure the Rubber tree good freedom from the scrub or undergrowth, while at the same time it is being shaded overhead by the trees of the virgin forest left standing. The style of Rubber tree thus obtained is similar in growth to the forest Rubber tree a long straight trunk with but few extending branches. In the preceding manner Mr. KOSCHNEY planted about 6 hectares (15 acres, for his neighbours Messrs. Kotelmann and Heynsohn, about 6 years ago, and so far the plantation leaves nothing to be desired. Mr. KOSCHNEY has several rubber trees of long standing in his pastures and other cleared ground, quite sufficient to prove that, alone in the open the rubber tree cannot flourish, a large number of lateral branches being developed; the flow of latex is very small and of poorer quality, and the tree often dies after a few tappings. The only known advantage of the rubber tree grown in the open is that for production of seed it is more prolific. In past years Mr. KOSCHNEY experimented unsuccessfully by adopting another method—that of felling all the timber after scattering rubber seed broadcast. Bananas were planted also at the same time. At first the rubber come up like corn, every seed seemed to have sprouted, but in a few months many died, and the increasing growth of the bananas affected the balance unfavourably.

Mr. CARL GRUTZMACHER, a settler in Cano Negro, is a strong advocate of another system in rubber-planting, differing considerably from the "light shade" method, and though his experience does not cover many years, his hopes of success are very bright at the present time. It calls for the seed-bed 6 or 8 months old, but the felling of *all* the trees in the forest for planting, the young plants being set out in rows 18 or 20 feet on each side of the rows of plants, and so on at regular intervals of three months until the plantation is 1 year old, when everything is cut down again, and the rubber trees stand alone in the open, but only for a short time. In about 3 months the soft-wood or charral growth is up again almost equal to the small Rubber trees, and another cut down in the rows is given, and repeated at gradually increasing intervals serving to give at all times an advantage in height to the Rubber tree above the charral, the latter serving as a perpetual and regulated shade to the trunk of the tree, but with no large forest trees to shade its crown. The growth of the tree is also similar to that of the wild Rubber tree. A little observation is needed to see that this is a tree grown precisely under the same conditions as the forest

Rubber tree, which is always found among charrals or shrub growth. There is a disadvantage in the first cost of this method, it being more expensive to fell all the virgin forest than a part of it, and at the same time leaving the ground more encumbered; and the clearings for the first two years are more frequent than in the "light shade" method, after which time they run about equal. Time is needed to show which of the two systems is the better; in results the "heavy shade" and "in the open" Rubber trees have both turned out failures, and are not being repeated where they have once been tried.

The only kind of Rubber planted in the Valley is the *Castilloa elastica,* and most of it on the flats at an altitude of 400 feet and less above sea-level, though one of the newer plantations—that of Mercedes Quesada is somewhere about the 1,500 feet level.

Many of the foreign settlers are at present hanging fire to see what the U. S. Government determines on the Isthmian Canal question. Should the Nicaraguan route be voted for, hundreds of families would be down in a short time from the States; in the other case many will draw out and abandon what they have invested in.

The following is a list of settlers who have made Rubber-planting their business in the San Carlos Valley:—

1. Messrs. Umfried and Schoch, at the head of Tabla Grande with 40 hectares (100 acres) which they started to plant 4 years ago.
2. Messrs. Hoppenstadt and Gillett, in Banco de la China, 3 hectares, all planted 6 years ago.
3. Mr. A. Long, below the mouth of Arenal river, 37 hectares, all planted at different dates since 1897.
4. At the mouth of the river "Tres Amigos", an American family the Hogans, are at present making preparations to plant Rubber on a large scale.
5. Mercedes Quesada has about 6 hectares of 6-year-old Rubber on his estate in very good condition.
6. Messrs. Kotelmann and Heynsohn have about 6 hectares of 6-year-old Rubber planted for them by Mr. Koschney in excellent condition and has had one tapping.
7. Mr. Koschney has on his estate 25 hectares of 2-year-old trees, 11 hectares of 1-year-old Rubber and 16 more being planted.
8. Mr. Koschner together with other planters have planted in Cano Negro 4 hectares barely a year old, many of the trees being now 2 metres high, 100 hectares being now actually planted and preparation being made to plant 350 hectares more.
9. Mr. Long has in Cano Negro 6 hectares planted about one-year old and is preparing to plant 30 hectares more.
10. Max Bergmann has several hundred trees planted in Cano Negro, 1 to 3 years old, all in good condition.

11. Carl Grutzmacher has about 4 hectares planted in Cano Negro, 3 years old, in very good condition.

Hoping that you will find the foregoing of sufficient interest to publish.

I remain,

Yours very truly,

ED.^ COELS.

EXPORTS OF INDIA RUBBER FROM MOZAMBIQUE.

The following is from the Consular Report on the trade of Mozambique for the year 1901 :—

A considerable falling off will be noticed in the value of the exports during the past year. These consist of ground nuts (Arachis hypogœa), copra, and a small quantity of ivory and calumba root. Several shipments of cowries have been despatched to the west coast, but it is unlikely that this shell will ever be found a very remunerative article of export.

Formerly india rubber was despatched in important quantities to Hamburg and elsewhere, but the export of this valuable commodity was stopped in the early part of this year, the authorities stating that owing to the admixture with the rubber of foreign bodies for the purpose of increasing its weight, it was acquiring a bad reputation on the European markets, and that until such time as the collectors of the juice could find means to produce a rubber calculated to create a demand for the produce of this country, no more should be despatched. Naturally this somewhat arbitrary order had a disastrous result, for many of the traders, who had accumulated large stocks, found themselves unable to put their produce on the market. The Governor-General has now withdrawn this prohibition, as will be seen from the following translation of an extract from the "Boletim Official de Mocambique" of May 10th, 1902 :—

Art. 223. Experience having demonstrated that the Rule established by Provincial Decree No. 115 of March 31st, 1898, relative to the exportation of india rubber, is prejudicial to the revenues of the district of Mozambique without putting a stop to the extraction of the rubber by means of "cooking" and crushing, and as it is most desirable to stop the destruction of the plants producing the rubber, in conformity with telegraphic instructions from His Excellency the Minister and Secretary of State for Marine and Foreign Affairs, I have determined the following :—

"(1) Exportation of rubber from the district of Mozambique is "permitted subject to the payment of the following duties :—

"(*a*) Rubber extracted by "cooking" 20 per cent. *ad valorem.*

"(*b*) Impure rubber extracted by incision, 8 per cent. *ad valorem.*

"(*c*) Rubber extracted by incision but pure, 3 per cent. *ad* "*valorem.*

"(2) The Director of the Customs Department will send and "collect samples of rubber and formulate precise instructions for "distinguishing between the three qualities above-mentioned.

"(3) The Chief of the Customs Department of Mozambique "will send monthly to the Governor of that district a note of the "exportation of rubber with the necessary explanations in order "that that authority may estimate the results of this arrangement "and report to the Governor-General."

RUBBER IN BERMUDA.

From the Report of the Board of Agriculture of Bermuda for the year 1901, it would appear that a commencement has been made to cultivate Para in that Island, *vide* the following extract:—

Rubber trees for the Marsh lands.

After three years I have succeeded in securing some seeds of the Para Rubber Tree (Hevea Braziliensis) which have germinated and are now growing. I have estimated that should the tree succeed in Bermuda, and sufficient plants are raised to plant the 400 acres of Marsh land, in six years a return of £20,000 worth of rubber (at the present prices) should be realized per annum. It is thought that the temperature here is unsuitable yet some plants of Castilloa elastica, and the Ceara rubber tree, are growing luxuriantly in the Public Garden, although the same was thought of it, *i.e.*, that the temperature would not be high enough.

METHODS OF EXTRACTION OF GUTTA PERCHA AND RUBBER.

A short account of the methods of extracting Rubber and Gutta percha from bark or leaves is published by M. Gaher in the Moniteur Scientifique.

Extraction of Gutta percha from leaves.

Rigole's process. The leaves are treated with a very volatile solvent by preference carbon disulphide. The solvent is removed by passing a current of steamo ver it and the isolated gutta purified by hydro-chloric acid and zinc chloride.

Serullas process. An alkaline solution is employed to separate the cellulose then the Gutta is dissolved in toluene in preference to Benzine. M. Serullas proposes also to destroy the cellulose by reagents at temperatures not effecting the Gutta.

Arnaud and Houseal process. The leaves are reduced to powder thrown into a great quantity of water, the gutta which comes to the surface is collected and pressed into a mass.

Blanchard Vivier process, consists in treating by alcohol which dissolves the resins chlorophyll and other impurities, then treating with carbon tetrachloride which dissolves the gutta.

Extraction of Rubber from the Bark.

The *Deiss process,* was described in the last number of the Journal.

The *Bapts and Hunet process* consists in treating the bark with caustic soda at the strength of 1/10 or more at a temperature of 130 to 140° C. under 2.5 kilogrammes of pressure, when the solvent has desintegrated the tissues the pasty mass is passed under perforated cylinders.

The process of the Ganguellas Negros is worth attention. They extract the rubber from roots (of what plant is not stated) they wash and dry them and make them into faggots then they are carried to the villages, where they beat them into pulp with mallets afterwards they boil them with water.

THE CULTIVATION AND TREATMENT OF RAMIE.

(*To the Editor of the "Pinang Gazette."*)

SIR,—I have had the pleasure of reading an article from the pen of Mr. CURTIS in your interesting paper,* on Ramie, Rhea or China Grass. From extensive experiments made in the different grades of this very fine fibre I have arrived at different conclusions than the authorities he quotes, and am quite confident that, although the ribbon could be delivered at the degumming factories at £7 9*s.* a ton instead of £12 in comparison with other fibres it would pay handsomely and be largely used, although £26 a ton was paid for it. At that price the finished article would not cost more than 4*d.* per ℔, in a condition similar to the enclosed sample. Contrary to the recognised theory I have conclusively proved to my own satisfaction that it is one of the least difficult of fibres to prepare for manufacturing purposes, and that the returns from dry stems grown in suitable localities such as the Straits Settlements far surpass those obtained from flax or hemp, with both of which I am intimately familiar, were Ramie put to the same ordinary uses as flax. The waste after being degummed would scarcely be a half of that in flax. I notice that there is a difficulty in connection with the cutting of the ribbon from the stems and that a machine that will accomplish this at the rate of half a ton a day is needed. There are such machines in use, now employed for other purposes, through which I have passed stems grown in the Botanic Gardens of Glasgow with far more wood than fibre on them and nearly as solid as a walking cane. These came out without a particle of wood adhering to the ribbon. The machine that I used I am sure would deliver not less than a ton of clean ribbon a day. In conclusion, allow me to say that no patent machine is needed for the preparation of the fibre, and that the process of degumming it cannot be protected. It might be kept a secret, but that is all, as I know of half-a-dozen ways of doing this, all of which are equally cheap and effective. Then the so called expert, whose ignorance of fibre and its treatment is amply demonstrated by the absurd and costly methods he employs, disappears and the mechanical efforts of the patentee are

* Bulletin 8. 295.

found in the scrap heap. Then and not till then will Ramie, Rhea or China grass get the chance that it has been denied. When this comes to pass it will revolutionize the industrial affairs of the Empire and bring untold wealth to Eastern climes. In this prosperity your favoured locality will largely share.

I am &c.,

JAMES ANDERSON.

Arbroath, Scotland.

P.S.—With a simple machine that can be got here for about £2 two men could easily remove not less than 200 lbs. a day of fibre from dry stems. Any patent machine driven by steam needing the attention of two men and only turning out say one cwt. a day is a costly farce.

TAPPING PARA IN NORTH BORNEO.

In a letter to the Editor, dated September 8th, 1902, Mr. G. J. ALTMAN, the General Manager of the North Borneo Trading Co., Ltd., writes as follows:—

The following may prove of interest to you with regard to time for tapping.

I tapped a large healthy tree at 4 p. m. The following morning, I found that the latex had coagulated directly it came into contact with the atmosphere and had not flowed even down the vertical groove. I finely sliced the incisions and on inspection at 3 p. m. found the sap had been flowing freely into receptacle placed at foot of tree.

The grooves were made obliquely into a vertical groove about $\frac{1}{4}$ in. to $\frac{3}{8}$ in. wide. The widening process the next morning was of the lightest, the edges of the incisions being scraped rather than sliced. Weather was fine, no rain.

GUAVA JELLY.

100 Guavas.

2 Catties sugar.

$\frac{1}{4}$ of a tea-cupful of lime juice.

Wash the guavas cut off the tops, and slice them ; and as you slice put them in water, then take them out, and put them into a pans add 8 tea-cupfuls of water, and boil; when well boiled strain them through a coarse duster, add the sugar, and boil till all the sugar melts, strain again, wash the pan, put in the juice and boil till it gets quite thick, then add the lime juice, and the boil till it will harden in cold water.

Then put into tins and skrim off the froth which rises.

MRS. GUNN.

NOTICES.

(1).

The Para Rubber trees in the Botanic Gardens, Singapore, are now commencing to produce the seed crop. Planters who have put their names down in previous years for seed, and no longer want any, are requested to write to the Director to inform him.

(2).

Correspondents are requested to stamp their letters fully, as a large number of letters have been received from various parts of the world either not stamped at all, or insufficiently stamped.

(3).

All applications for Bulletins should be made to the Editor who will also receive subscriptions.

(4).

Subscribers to the Bulletin are reminded that their subscriptions end with this number. Subscriptions for the ensuing volume of twelve numbers are to be paid in advance.

SINGAPORE MARKET REPORT.

August, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	45	30.00	29.00
Bali	296	24.50	20.75
Liberian	219	19.25	18.50
Copra	4,570	10.25	9.15
Gambier	3,020	14.50	14.00
Cube Gambier, Nos. 1 & 2	125	23.00	18.00
Gutta Percha, 1st quality	...	450.00	300.00
Medium	...	300.00	150.00
Lower	...	150.00	50.00
Borneo Rubber	...	134.00	70.00
Gutta Jelutong	...	6.65	5.60
Nutmegs, No. 110's	...	48.00	46.00
No. 80's	...	80.00	78.00
Mace, Banda	...	90.00	85.00
Amboyna	...	100.00	78.00
Pepper, Black	554	37.00	31.75
White	653	54.00	51.00
Pearl Sago, Small	90	5.30	4.80
Medium	...	5.90	5.40
Large	...	6.20	5.50
Sago Flour, No. 1	3,591	4.05	3.62½
No. 2	405	2.00	1.80
Flake Tapioca, Small	680	7.00	4.30
Medium	45	5.50	5.00
Pearl Tapioca, Small	614	6.50	4.35
Medium	1,194	6.87½	4.30
Bullet	...	6.25	5.00
Tin	3,260	84.37½	79.25

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st August, 1902.

Wired at 6.35 p.m. on 1st Sep., 1902.

			Tons Steamer.
To England:—			
Tin	from Singapore & Penang to England and U. K. optional any ports		1,500
Gambier	from Singapore	to London	40
„	„ „	to Liverpool	...

			Tons Steamer.
Gambier	from Singapore	to U. K. & / or Continent	- 50
,,	,, ,,	,, Glasgow	- ...
Cube Gambier	,, ,,	,, England	- 60
White Pepper	,, ,,	,, ,,	- 120
Black ,,	,, ,,	,, ,,	- 80
White ,,	,, Penang	,, ,,	- 20
Black ,,	,, ,,	,, ,,	- 60
Pearl Sago	,, Singapore	,, ,,	- 90
Sago Flour	,, ,,	,, London	- 1,200
,,	,, ,,	,, Liverpool	- 100
,,	,, ,,	,, Glasgow	- ...
Tapioca, Flake	,, S'gapore & P'nang	to England	- 210
,, Pearl & Bullets	,, ,,	,, ,, ,,	- 220
,, Flour	,, Penang	,, ,,	- 160
Gutta Percha	,, Singapore	,, ,,	- 170
Buff. hides	,, ,,	,, ,,	- 50
Pineapples	,, ,,	,, ,,	cases 15,000
Copra	,, ,,	,, ,,	- 200
To America:—			
Tin	,, Singapore & Penang		- 750
Gambier	,, ,,		- 1,900
Cube Gambier	,, ,,		- 10
Black Pepper	,, ,,		- 330
,,	,, Penang		- 390
White Pepper	,, Singapore		- 50
,,	,, Penang		- 110
Nutmegs	,, Singapore & Penang		- 34
Tapioca, Flake & Pearl	,, ,, ,,		- 1,100
Pineapples	,, ,, ,,		13,250
To the Continent:—			
Gambier	from Singapore	to South Continental Ports	350
,,	,, ,,	,, North ,,	- 130
Black Pepper	,, ,,	,, South ,,	- 240
,,	,, ,,	,, North ,,	- 10
,,	,, Penang	,, South ,,	- 20
,,	,, ,,	,, North ,,	- ...
White Pepper	,, Singapore	,, South ,,	- 80
,,	,, ,,	,, North ,,	- 200
,,	,, Penang	,, South ,,	- ...
,,	,, ,,	,, North ,,	- 70
Copra	,, Singapore & Penang	to Marseilles	- 150
,,	,, ,, ,,	,, Odessa	- 740
,,	,, ,, ,,	,, South Continental Ports other than Marseilles and Odessa.	- 860
,,	,, ,, ,,	to North Continental Ports	560
Tin	,, ,, ,,	,, Continent	- 450

						Tons Steamer.
Tapioca Flake	from Singapore & Penang	to Continent			-	120
Tapioca Pearl	,,	,,	,,	,, ,,	-	60
Cube Gambier	,,	Singapore	,,	,,	-	60
Pineapples	,,	,,	,,	,,		750

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

650 tons Gambier
250 ,, Black Pepper
(*in Singapore*)
} contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C.

(*B*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th September, 1902.

Wired at 4.25 p. m. on 16th September, 1902.

				Tons Steamer.
To England:				
Tin	from Singapore & Penang to England and U. K. optional any ports		-	1,800
Gambier	from Singapore	to London	-	...
,,	,, ,,	to Liverpool	-	10
,,	,, ,,	to U. K. &/or Continent	-	70
,,	,, ,,	to Glasgow	-	20
Cube Gambier	,, ,,	to England	-	60
White Pepper	,,	to ,,	-	110
Black Pepper	,, ,,	to ,,	-	...
White Pepper	,, Penang	to ,,	-	...
Black Pepper	,, ,,	to ,,	-	40
Pearl Sago	,, Singapore	to ,,	-	50
Sago Flour	,, ,,	to London	-	480
,,	,, ,,	to Liverpool	-	1,000
,,	,, ,,	to Glasgow	-	150
Tapioca, Flake	,, S'pore & P'nang	to England	-	420
,, Pearl & Bullets	,, ,,	to ,,	-	410
,, Flour	from Penang	to ,,	-	550
Gutta Percha	from Singapore	to England	- -	70
Buff hides	,, ,,	to ,,	- -	70
Pineapples	,, ,,	to ,,	-	cases 5,500
To America:				
Tin	from Singapore and Penang		- -	530
Gambier	,, Singapore		- -	900
Cube Gambier	,, ,,		- -	20
Black Pepper	,, ,,		- -	210
,,	,, Penang		- -	310
White Pepper	,, Singapore		- -	60
,,	,, Penang		- -	70

		Tons Steamer.
Nutmegs	from Singapore and Penang - -	24
Tapioca, Flake and Pearl	„ „ „ - -	550
Pineapples	„ „ -	cases 5,000
To the Continent:		
Gambier	from Singapore to South Continental Ports	50
„	„ „ „ North „	70
Black Pepper	„ „ „ South „	10
„	„ „ „ North „	...
„	„ Penang „ South „	40
„	„ „ „ North „	...
White Pepper	„ Singapore „ South „	10
„	„ „ „ North „	80
„	„ Penang „ South „	30
„	„ „ „ North „	80
Copra	from Singapore & Penang to Marseilles	280
„	„ „ „ Odessa	580
„	„ „ „ South Continental Ports other than Marseilles and Odessa.	340
„	„ „ „ North Continental Ports	1,050
Tin	„ „ „ Continent	320
Tapioca Flake	„ „ „ „	50
Tapioca Pearl	„ „ „ „	370
Cube Gambier	„ Singapore to Continent	10
Pineapples	„ „ „ „	cases 1,500

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,500 tons Gambier
100 „ Black Pepper
(*in Singapore*)
contracted for during fortnight ending as above.

Telegraphed to A. A. Niblett, Ingram House, 165, Fenchurch Street, London, E. C

Singapore.

Abstract of Meteorological Readings for August, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·863	139·8	81·1	88·1	73·7	14·4	77·7	·873	75·3	75	S. E.	4·62	1·52

K. K. Hospital Observatory,
Singapore, 19th September, 1902.

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S. S.

Penang.

Abstract of Meteorological Readings for August, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·897	147·7	80·3	88·6	74·1	14·5	75·5	·792	71·1	71	S.	6·69	1·68

Colonial Surgeon's Office,

Penang, 8th September, 1902.

G. D. FREER,

Acting Colonial Surgeon, Penang

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for August, 1902.

Districts.	Max-imum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Wind.	Total Rainfall
			Max-imum.	Min-imum.	Range.	Mean wet Bulb.	Vapour Tension.	Humi-dity.		
Taiping ...	153	82·11	93	71	22	77·31	·873	80	13·32	2·45
Kuala Kangsar ...	...	80·91	90	72	18	76·36	·850	80	9·34	1·75
Batu Gajah ...	159	81·62	93	72	21	77·19	·874	81	7·54	1·18
Gopeng ...	...	80·84	92	65	27	75·36	·850	80	11·29	2·29
Ipoh ...	...	81·37	92	70	22	76·59	·853	80	8·27	1·11
Kampar ...	...	...	92	69	23	...	...	...	17·23	4·63
Teluk Anson ...	...	81·76	91	71	20	77·25	·876	81	3·12	1·06
Tapah ...	..	81·30	93	69	24	76·80	·862	81	9·24	1·50
Parit Buntar ...	...	82·49	93	71	22	77·55	·878	79	3·56	1·25
Bagan Serai ...	...	81·86	92	70	22	77·04	·866	80	2·96	·89
Selama ...	...	82·23	90	71	19	77·71	·889	81	11·32	2·45

STATE SURGEON'S OFFICE,
Taiping, 15th September, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for August, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·880	151·4	81·4	90·3	72.0	18·3	76·8	0·835	73·9	77	Calm	4·91	1,02
Pudoh Gaol Hospital "	...	...	...	...	...	..	...	...	...	...	...	5·11	0·95
District Hospital "	...	...	...	...	...	...	...	...	...	...	...	7·46	1·50
" Klang	...	...	...	85·3	74·3	11·0	...	...	...	...	...	5·03	1·38
" Kuala Langat	...	...	...	85·2	72·8	12·4	...	...	...	...	...	8·00	1·74
" Kajang	...	...	...	86·1	75·7	10·4	...	...	...	...	...	5·05	1·12
" Kuala Selangor	...	...	...	85·7	76·5	9.2	...	...	...	...	...	3·63	1·99
" Kuala Kubu	...	...	...	92.8	72·2	20·6	...	...	...	...	...	5·61	1·90
" Serendah	...	...	...	87·8	75·0	12·8	...	...	...	...	...	5·56	1.35
" Rawang	...	...	...	86·2	73·7	12.5	...	...	...	...	...	5·56	1,04
" Jeram	...	...	...	...	...	...	...	...	...	...	...	5·39	2·73

State Surgeon's Office,
Kuala Lumpur, 11th *September, 1902.*

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for August, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, District H'pital	...	...	...	92.	71·	16·5	...	...	...	...	...	3·51	·90
Kuala Lipis - -	...	...	82·2	94·0	70·5	23·5	...	...	...	...	...	4·97	1·69
Raub - - -	...	...	82·09	94·0	70·0	19·54	...	...	...	...	...	2·60	1·18
Bentong - - -	...	...	78·0	92·0	64·0	28·0	...	...	...	...	...	2·14	·81
Kuantan - - -	...	...	...	86·	71·	15·	...	...	...	...	...	4·65	1·70
Temerloh - - -	...	...	...	94·	71·	23·	...	...	...	...	...	2·64	1·14

Pahang, 11th September, 1902.

D. H. McCLOSKY,
District Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for August, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	83·8	91·1	71.0	20·1	78·7	...	...	...	S. W.	3·47	0·73

Muar, 1st September, 1902.

FRANCIS PEARS.

No. 13.] NOVEMBER, 1902. [VOL. I.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

EDITED BY

H. N. RIDLEY, M. A., F. L. S.,

Director of Botanic Gardens and Forests, S. S.

CONTENTS.

Annual Subscription—Three Dollars.
Single Copy—Fifty Cents.

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or from MESSRS. KELLY & WALSH, Limited,
No. 6, Battery Road, Singapore.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua-"tion regarding new or little known natural or manufactured pro-"ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M.A., F.R.S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. Curtis, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN

OF THE

STRAITS

AND

FEDERATED MALAY STATES.

No. 13.] NOVEMBER, 1902. [VOL. 1.

FRUITS OF THE MALAY PENINSULA,—*Continued.*

RUBIACEÆ.

This order contains but few edible fruits, and none of these are indigenous to our region. The Negro peach of Africa *Sarcocephalus esculentus* has long been in cultivation in the Botanic Gardens. It is a half scandent shrub with balls of white flowers, followed by a pinkish head of fruits, about an inch through. This however is not very delicious though it is sweet. It is really not worth cultivating except for its ornamental flowers.

The Voa vanga of Madagascar, *Vangueria edulis* is another exotic fruit which has been introduced here. It is a large shrub with green flowers, and green fruits about an inch through. It fruits in the Botanic Gardens, but can hardly be considered worth cultivating for its fruit, which when overripe suggests the flavour of a medlar, but is far from being as excellent a fruit as that. I have found natives who appreciated it.

The large white translucent head of fruits of the Mengkudu, *Morinda tinctoria* is sometimes eaten by Malays, who however, do not appear very fond of it. It is not likely to be appreciated by Europeans, as it tastes most like a mixture of soap and sugar.

VACCINEACEÆ.

The berries of *Vaccinium malaccense*, a shrub growing often abundantly by the seashore in sandy places, is quite eatable. It resembles a bilberry in appearance and taste, but is firmer and less juicy.

MYRSINEÆ.

The drupes of the Mata Pelandok *Ardisia crenulata*, a common shrub in open country with pink flowers and scarlet fruits, are eaten by natives.

SAPOTACEÆ.

The best known of the fruits of this order is the Sapodilla, or Sapoti, called in the Straits the Chiku (*Achras Sapota*). This is the fruit of a large shrub, hardly a tree, a native of the West Indies. The fruit is oval or globose with a thin brown skin and a good deal of brown flesh enclosing one or two hard black seeds. The fruit is produced nearly all the year round and requires to be

ripened in bran or in a dry place, till it is quite soft. It has a slight flavour of chocolate, and is very sweet, but fruits vary a good deal, in the matter of flavour as well as in size. The largest I remember to have met with was imported from Sumatra and was 3½ inches long and 3 inches wide and weighed eleven ounces.

The Sapodilla, can be grown from cuttings or marcottings, or from seed. It is said to fruit earlier from cuttings than from seed. It grows fairly fast in rich soil and fruits when quite small. I have even seen plants grown in a kerosine tin bearing a fair supply of fruits.

The Star-apple *Chrysophyllum Cainito*, also a native of South America, has been long in cultivation here, but the fruit is small about as big as an olive, dark claret colour and not worth eating. It is perhaps better in its native country.

The fruit of the Bunga Tanjong (*Mimusops elengi*), is mentioned in Le Maout and Decaisnes system of Botany as a valuable tropical fruit under the name of the West Indian Medlar, I doubt if here even Malays would eat it.

The Sau, *Mimusops Kauki*, is cultivated in Malacca where are some very fine old trees. It is a handsome tree with orange fruits considerably larger than those of *Mimusops Elengi*, and decidedly more eatable.

EBENACEÆ.

The best fruit of this order cultivated here is the Butter fruit. Mabola of the Philippines, *Diospyros discolor*.

This is a very handsome bushy tree about thirty feet high with a dense crown of large dark green leaves. The flowers borne along the branches in small tufts are creamy white. The fruit produced abundantly, is as large as a large peach bright pink in colour. but covered with a yellowish brown fur, easily rubbed off. The flesh is cream coloured, and when properly ripened is of the softness of butter, whence its name. It has a flavour of strawberries and is certainly an excellent fruit as well as a very beautiful one. It has however rather a strong scent which is not pleasant to all persons. The fruit should be taken off when fully developed and put by in a dry place to ripen.

The value of the fruit depends much on its being perfectly soft and ripe when eaten. Occasionally it does not ripen properly but remains rather firm in texture and though even then quite eatable and not at all to be despised, the flavour of the fruit is not fully brought out. The finest tree I have seen is in the Botanic Gardens in Penang but there are also fine ones in Singapore and other parts of the Straits. The Butter fruit (Bua Manteiga), is by no means as much cultivated as it should be. It is rarely to be seen in any but the Botanic Gardens and such places, though the Chinese began to cultivate it some time ago I have no information as to the fruits having been seen in the market as yet.

The tree is raised from seed, of which there are several of fair size in each fruit. It is of fairly fast growth and soon becomes a handsome tree. The fruit is ripened in June to September. I have

seen trees which though heavily floriferous have never been known to produce fruits. As most of the species of the genus are unisexual, it is probable that these are strictly male trees.

The Kaki of Japan and China (*Diospyros Kaki*) is well enough known to town residents as the fruit is largely imported from China for sale. It will not thrive in the Straits, the climate being probably too hot for it.

APOCYNACEÆ.

The fruits of some species of *Willughbeia* are eaten by natives, but contain too much India rubber to be pleasant. The best I have tried is the small fruited *W. dulcis* of Pahang, a low climber with small apricot coloured fruit about as big as a pigeon's egg, very soft and sweet but full of rubber.

Carissa carandas, L. Karanda, is a pretty spiny shrub with fragrant white flowers. The fruit is at first pink then becoming black about an inch long. It is best cooked, and is said to make a good imitation of Red Currant Jelly. The shrub grows best in sandy and dry places, and makes good hedges. Native of India.

LAURINEÆ.

The Avocado Pear, *Persea gratissima* a South American tree, is not as much cultivated in the Straits as it should be. It is a moderate sized tree with pear-shaped or oblong fruit, green or brownish-purple, with a very large round seed in the centre. The flesh surrounding the stone is yellow and green, soft and buttery with a delicate flavour, much appreciated by many. It is eaten raw with pepper and salt. The tree raised from seed grows well in good soil in Singapore, and fruits well once a year. The fruit is very liable to the attacks of bats, and has to be covered with netting or cloth to keep them off.

URTICACEÆ.

The most important genus of this order is that of *Artocarpus*, of which several species are eatable.

The Bread-fruit, *Artocarpus incisa* is an introduced tree easily known by its dark green lobed leaves. It is not rarely planted and is to be seen in many of the older Settlements but certainly does not play the important part in the food of the natives here that it does in South America and elsewhere in the tropics. The tree does not, as a rule, attain the great size that it does in South America nor is the fruit as good, being more woody. The Bread-fruit is a globose mass of small fruits, of a dark green colour, with white flesh inside. It is about as large as a child's head when fully developed, but usually much smaller here. It is eaten either boiled, and sliced and spread while hot with butter or baked either whole or in slices.

The Jack, *Artocarpus integrifolia* is almost too well known to require description. It is very extensively grown here as indeed all over the East. The fruit (or rather head of fruits) always borne on the old wood, attains an enormous size, and is one of the most popular fruits with the natives. It varies very much in flavour,

some forms being very sweet and as well flavoured as a pine apple, others are somewhat acid, or have an unpleasant leathery taste. It is comparatively seldom eaten by Europeans and indeed is not suited to them, being apt to disagree with the digestive organs. The fruit when ripening is enclosed in mat bags to keep off the squirrels, bats, and other such animals, and also insects which speedily attack it.

The Champedak, *Artocarpus polyphemia* differs from the Jack in its smaller white fruits, very popular with natives but having a nauseous flavour and odour, which would deter any European from eating it. It is a native of the Peninsula being wild in many of the denser forests. The wild form, however, differs in possessing very many more seeds than the cultivated one, and is not usually eaten, even by Malays.

The seeds of this plant and the Jack are often roasted and eaten as nuts.

The Monkey Jack, Tampunei, *Artocarpus rigida*, is a very fine tree with deep green foliage, and orange yellow fruits about 6 inches through, the outside covered with short blunt processes. When ripe it is easily opened, and discloses small seeds about a quarter of an inch long in a sweet delicately flavoured orange pulp with a taste of honey. It is well worth cultivating as the fruit is far the best in the genus, and may rank as one of the best fruits in the East. The tree which attains the height of 60 feet, often fruits when about 14 or 15 feet tall, and is a native of our forests. The fruits are attacked by Musangs and Monkeys as well as by fruit bats.

The Tampang *Artocarpus Gomeziana*, is a very different kind of fruit from any of the others though the tree has a similar appearance to that of the Tampunei. The fruit is soft smooth more or less globular, about three inches through green outside and rose pink within, pulpy all through, and rather acid. It is generally cooked before eating and might be used for making preserve.

The Kulun, said to be a variety of the Bread-fruit is often planted in Singapore. The fruit resembles that of the Bread-fruit in form and colour, but is sweet.

All the Artocarpi are grown from seed.

Figs *Ficus Carica*, have long been grown in the Botanic Gardens, and though the plants make but little growth, they live and produce a few figs each year. The variety grown is the white (or rather green) fig, other varieties might be tried, perhaps with more success, and a dryer climate than that of Singapore might suit them better. I have seen excellent fig trees supplying plenty of fruits in Brazil, grown in sandy spots near the sea, so that they will grow and thrive in tropical regions. The flavour of the Singapore figs is not as good as that of European ones and they are rather dry.

There are a great many kinds of wild figs in the Peninsula, of most of which the fruit is very small, and either tasteless or unpleasant. The small figs of Ficus Cunea which are red with white spots and borne on branches running along the ground and half buried are sweet and eatable.

Hulletia dumosa.—A low shrub, with oddly shaped triangular rounded orange fruits with one or two seeds enclosed in a sweet pulp occurs in the hill forests. The fruits are eatable and pleasant.

Treculia africana.—A large handsome African tree is grown in the Botanic Gardens. The fruit like that of an Artocarpus is large and almost pear shaped. It is quite uneatable but the seeds are roasted and eaten like chestnuts. They are not large, nor much better than numbers of other seeds of the kind.

EUPHORBIACEÆ.

The greater number of the plants of this large order are poisonous, and so supply no eatable fruits. The great exception is in the genus *Baccaurea* of which the best here is *B. Motleyana* the Rambai a tree very common in cultivation, and possibly wild. It is a medium sized tree, with the flowers in long racemes from the branches They are unisexual, the female flowers being the largest and some trees are practically males, either bearing no female flowers, or only a few abortive ones. The fruit is borne in long hanging racemes and resemble Dukus in appearance, being elliptic smooth and light buff colour, with a thin rind enclosing three flat green seeds enclosed in a semitranslucent pulp. Good trees produce large quantities of fruits, but there is a considerable difference in the quality. Of some trees, the fruit is acid, in others sweet and tasting like grapes. The Rambai can be eaten raw or stewed, and it makes very good pies.

There are one or two other Baccaureas of which the fruit is eatable, and a popular one is the Tampoi *B. Malayana*, this has globose fruit with a thick brown rind which splits in three and seeds enclosed in pulp similar to those of the Rambai. The tree is smaller and not very often cultivated though the fruits are sold in the streets in Singapore.

B. parviflora, Muell. Arg. 'Setambon' is a small tree 12 or 15 feet tall. The flowers of which are borne in racemes at the base of the stems. They are strictly unisexual the trees being male or female. The male flowers are yellow, and scented like Cowslips. The fruit is peculiar, it is fusiform about an inch long pointed at both ends, claret colored and borne often in great abundance forming a great pile on the ground at the base of the stem. It is quite eatable, rind and all though acid and would probably be best cooked.

Cicca acidissima, Chermei, is a small tree with pinnate foliage, and green drupes with a hard central stone, borne on the stems and wood of the older branches. It is a native of India and is worth cultivating. The fruit is too acid to be eaten raw but makes excellent pies, stewed with plenty of sugar.

The Malakka, *Phyllanthus pectinatus* a small or medium sized tree with feathery foliage has somewhat similar fruit, but it is inferior as the amount of flesh on the comparatively large stone, is less. It is eaten by natives, and is common in our woods.

The P'rah tree, *Elateriospermum Tapos*, is a very handsome forest tree common in some of the hill woods. The seed is said to be an important article of diet with the Sakais, who assemble in the localities where it is abundant when the crop is ripe, and live upon it.

Cupuliferæ.

There are several species of Chestnuts (*Castanopsis*) in the Straits, but the fruit is inferior to that of the English Chestnuts. The most popular species is *C. Wallichiana*, which is very common in the low country, a big tree with spiny fruit and narrow leaves. The chestnuts are small and have rather a hard rind, which makes them troublesome to open. They have quite the flavour of the English chestnut and are used by the Malays, boiled to ornament cakes.

Gnetaceæ.

Gnetum guemon, the Maningo, is a tree sometimes but rarely planted, being introduced from Java by the Javanese. It is a handsome tree and produces small oblong seeds which when peeled are eaten, they have a pleasant nutty taste.

Orchideæ.

The fruit of the wild vanilla, *Vanilla Griffithii*, a climber with beautiful white flowers, and clusters of soft fruits like small Bananas is juicy and sweet. It fruits in January, but is seldom to be found in fruit. It has not the faintest trace of vanillin.

Amaryllideæ.

The fruits of *Curculigo latifolia*, and other species are eatable though very small about half an inch long fusiform and hidden away among the bracts of the flower head at the base of the leaves. They have a taste of sweetened cucumbers, and are hardly worth mentioning except for a peculiar property they possess. Although they are by no means very sweet, and leave no distinct sweet taste in the mouth afterwards, yet for some considerable time any liquid that is drunk after eating one or two seems to possess a strong mawkish sweetness. The effect lasts for an hour or so.

The plant is commonly known as Lumbah.

Hydrocharideæ.

The fruit of the marine plant Setul (*Enhalus acoroides*), a common herb with long grassy leaves growing in sandy spots in shallow sea round our coasts is eaten by children. It is a curious looking hairy green fruit borne on long twisted peduncle.

Aroideæ.

Monstera deliciosa.—A native of South America is an ornamental aroid with large peculiarly perforated leaves which is cultivated in a few gardens and not rarely fruits. It bears a long cylindrical mass of small fruits, of a delicious flavour, but difficult to eat on account of the abundant raphides in the remains of the flower.

Bromeliaceæ.

The pine-apple *Ananassa sativa*, is well enough known. A full account of it and its cultivation will appear in a later number of the Bulletin.

PALMŒ.

It is unnecessary to do more here than refer to the coconut. Of other palms but few give any fruit worth eating.

The fruits of nearly all the rattans, *Calamus* and *Dœmonorops*, are eaten by Malays. The eatable portion being a thin layer of sweet pulp around the seed. The fruit of the Salak, *Zalacca edulis*, a bushy thorny palm, native of Java is regularly sold in the streets in May. It is a dark brown scaly fruit, containing three or fewer seeds enclosed in a firm white flesh. It is very popular among natives, but seldom eaten by Europeans. Plants of the Salak grown for many years in Singapore Botanic Gardens have never yet produced fruit.

The Asam Paya, or Kelubi, *Zalacca conferta* is an aquatic species growing in great thickets in jungle swamps. It is stemless or nearly so with immense thorny leaves. The fruits are borne in clusters at the base of the leaves, and are of a light yellow brown color, and covered with scales. The pulp surrounding the seeds is white and juicy but very acid. It is gathered and eaten by Malays, but is not cultivated anywhere.

The fruit of the Nipa palm *Nipa fruticans* so abundant along tidal rivers, contains a small quantity of slightly sweet albumen in the seed which is eaten, being something like the albumen of the young coconut in flavour but sweeter.

AGRICULTURE IN BAHIA AND SERGIPE, BRAZIL.

The Consular Report for 1901 has the following under the above heading:—

Cocoa.—The quality of cocoa exported in 1901 was in excess of the figures for 1900, but the actual value of the exports is considerably less. New plantations come into bearing every season, and the cultivation of this article continues to prove profitable to the planter, notwithstanding the fall in prices.

Increased production may safely be looked for, but the progress will be slow owing to the limited area of land suitable for cocoa planting, and the length of time (five years) required for the development of the tree. He vy rains affected the quality of the crop, but this might to a great extent have been mitigated if the planters would only bestow adequate attention on the drying of the gathered beans. They are often collected when damp, and subsequently smoked in order to dry them. The methods employed are primitive, and the operation scamped, with the result that the bean acquires an unpleasant smoky flavour, and is unsuitable for the manufacture of chocolate. Local British and German firms practically monopolise this trade, but the buying orders appear to all emanate from Hamburg. The United States purchase direct, but not to any extent.

Coffee.—The important trade of coffee again showed a falling-off, prices proving so unsatisfactory to planters that they preferred

to retain their stocks sooner than sell at what would have given them barely sufficient to cover expenses. This was especially the case when the planter resided any distance from the capital; owing to the dearness of transport to the railway, which is mainly effected by mules. At the commencement of the year prices ran to about £1.10 per cwt., but fell in July and August to from £1.1 to £1.3, rising again to £1.10 in November. At the close of the year, business was at a complete standstill, and the market showed a weak tendency.

The quality of the crop was equal to the average of former years, and would have been better could planters be only induced to give more attention to the hulling of the berry. This operation is performed so carelessly that the bean gets chipped and broken, with the result that the appearance of the coffee suffers, and its commercial value is lessened. The drying process also leaves much to be desired, and coffee, like cocoa, arrives on the market with a smoky flavour, which is much objected to by European buyers. As formerly, the United States and Germany are the chief purchasers, but last year other orders arrived from the Mediterranean. The outlook for the present year is not bright, because with exchange at 12 per cent. the value of Brazilian coffee is reduced to a minimum, and although the planters may not abandon the industry, it is certain that it cannot give a profit to employers of labour, although the small cultivator, who works his own ground, and employs his own family as collectors, manages to secure the means of existence.

India rubber.—The fall of price abroad in India rubber (nearly 25 per cent.) caused the trade for the past year to be very small. The difficulties experienced in collecting any quantity of this article and the fluctuations in exchange render it probable that India rubber may soon disappear from the Bahia export list.

RUBBER IN FRENCH GUINEA.

THE FOLLLOWING IS FROM THE DIPLOMATIC AND CONSULAR REPORT ON THE TRADE OF FRENCH GUINEA FOR THE YEAR 1900.

The commercial crisis which commenced in 1900, the effects of which still continue to be felt, was due to the fall in the price of rubber, which, while it affected all the rubber-producing countries, was specially felt in French Guinea, eight tenths of whose exports consist of that article. In addition there were special reasons which caused the colony to suffer.

Having been a rubber producing country for many years, the vines, owing to wasteful methods of tapping them, had become comparatively scarce, and in order to increase the quantity of rubber for sale, the natives adulterated it in various ways. The merchants, anxious to profit by the high market, accepted the bales without examination, with the result that the rubber bought from the natives during the season 1899-1900 contained as much as 25 per cent. of impurities,

The home markets, who could obtain rubber of a much higher quality from other sources, refused to buy the Guinea rubber, which thus remained on the hands of the merchants, who in many cases were compelled to sell at a loss.

In the meantime European goods were accumulating in the merchants' stores at Conakry, as they had given their orders before the fall in prices. But the natives, alarmed at the low prices they were offered for their rubber, (50 per cent. less than the year before) only sold enough to pay their taxes and to buy such European articles as had become indispensable to them. As they had long ceased to cultivate anything but rubber, the fall in that article found them with nothing to replace it.

UNITED PLANTERS' ASSOCIATION, F. M. S.

Minutes of a General Meeting of the United Planters' Association, F. M. S., held at the Selangor Club, Kuala Lumpur, on Monday, 18th August, 1902.

Meeting commenced at 12.15 noon.

PRESENT:—Messrs. E. V. CAREY (Chairman), C. R. MEIKLE, E. B. SKINNER, M. S. PARRY, H. C. RENDLE (Members of Committee), Messrs. A. M. BARNWELL, F. M. BELL, A. G. TANNER, R. M. MITCHELL, W. McD. MITCHELL, P. STEPHENSON, P. W. PARKINSON, W. NICHOLAS and H. M. DARBY (Honorary Secretary).

1. The notice calling the meeting having been taken as read, the minutes of the last General Meeting were also taken as read, and duly confirmed.

2. Read letter from the Honorary Secretary, Negri Sembilan Planters' Association, naming the Chairman, the Honorary Secretary and Mr. S. MOORHOUSE as the representatives of that Association on the Committee of the United Planters' Association, also expressing regret that prior engagements prevented any of the Negri Sembilan Planters' Association members attending the meeting and asking that in future the members of their Association be consulted before fixing the date of meeting.

The Chairman said that he was very glad to hear that the Negri Sembilan Planters' Association members of Committee had been elected, but regretted that the 30 days' notice given of this meeting was not sufficient.

The Honorary Secretary was instructed to write to the Honorary Secretary, Negri Sembilan Planters' Association, that the members present regretted the inability of the Negri Sembilan Planters' Association members to attend, and that in future the Honorary Secretary of their Association would be consulted as to date of meetings.

3. Government correspondence—

(*a*) Read letter No. Misc. 2897/1902 from Secretary to Resident-General to the Chairman covering correspondence between the Resident-General and Superintendent, Straits Settlements Emigration Depôt, Negapatam, regarding the appointment of an Assistant Superintendent

at Negapatam. Owing to the Government of India Notification No. 836 of 6 March, 1897, prohibiting recruitment of labour for this country in the Bombay Presidency, it is not considered necessary to appoint such an official at present.

The Resident-General had received a similar communication from the Hon'ble Colonial Secretary, Straits Settlements, and he is now urging the Straits Government to endeavour to procure the cancellation of this Notification so far as it affects the Straits Settlements and Federated Malay States.

The meeting agreed that the order might with advantage be cancelled as regards the Straits Settlements and Federated Malay States.

(*b*) Read letter No. C.S. 3467/02 from Secretary to Resident-General to the Chairman covering correspondence between the Honourable Colonial Secretary, Straits Settlements, and the Superintendent, Straits Settlements Emigration Depot, Negapatam, with a report from the latter regarding the recruiting of labour from Northern India.

The cost of recruiting labour would amount to Rs. 61 per head landed at Penang. Resolved that the meeting agree with and support the Chairman's letter to the Resident-General to the effect that recruiting from the North of India has been demonstrated by Dr. FOSTON to be quite impracticable on the score of expense alone apart from the many other considerations upon which he dwells, but that para. 8 of his report might well receive the attention of the Government in the Colony.

Para. 8 referred to—

"In view of the fact that the Government of India has removed all executive interference over emigration to the Straits I really cannot understand why the Straits Government should desire to have the terms *re-explained* to intending emigrants by an India Official when that has already been done by the Agent for the Straits—viz., the Superintendent of the Depôt—unless the Government is unable to trust the work entirely to the latter officer."

(*c*) Read letter No. Misc. 4137/02 from Secretary to Resident-General to the Chairman covering a letter from the Superintendent, Straits Settlements Emigration Depôt, Negapatam, asking to be allowed at his discretion to extend the period of Recruiters' Licenses, also for instruction as to whether he is to insist on Licenses being produced in cases where Canganies or Recruiters have only a note from their employers applying for State-aided passages for coolies.

The Resident-General asks the favour of the Chairman's opinion on the matter and considers himself that Dr. FOSTEN should be empowered to extend the period of Canganies' Licenses, and that all Recruiters should certainly be provided with Licenses.

Resolved that the meeting endorse the Chairman's letter as below to the Resident-General on the subject:

"I quite agree that Dr. FOSTON should be empowered to extend the period of Licenses at his discretion, and I also think with the Resident-General that all Recruiters of free labour should be provided with Licenses. It is the simplest matter for employers to obtain these Licenses in the Federated Malay States and such slipshod methods as sending Recruiters over, fortified only with letters, should not be encouraged, otherwise there would appear to be no object in having the License system at all.

"It sometimes occurs, however, that a cooly, who has returned to his country, is anxious after a while to come back to his old estate and bring some of his friends with him. In such a case it would be rather hard if the planter or employer at this end were compelled to send a special man with a License to bring the coolies over, and I think that Dr. FOSTON should be empowered, under these circumstances, to issue State-aided tickets upon receipt of a communication from the employer explaining the situation, or even upon application from the leading cooly, if satisfied of the *bonâ fides* of his story.

"Having before us the undoubted fact that the country is still very much under-stocked as regards Tamil labour, it would appear to be impolitic to put any obstacles in the way of immigration if sufficient cause can be shown for a departure from the orthodox system in certain special cases."

(*d*) Read letter No. H.C. 4247/02 from the Resident-General to the Chairman enclosing three copies of his Annual Report for 1901 and a copy of a letter from the High Commissioner in which his Excellency refers to the courageous and persistent determination of the European Planters in the Federated Malay States.

The meeting heartily approved of the Chairman's reply that the Planters were much gratified at the cordial reference to their work to which both the High Commissioner and the Resident-General had given expression.

(*e*) Read letter No. Misc. 3785/02 from the Secretary to Resident-General to the Honorary Secretary, United Planters' Association, enclosing for the information of Association copy of a circular Despatch from the Secretary of State regarding the recent Sugar Conference at Brussels.

The papers were laid on the table for the information of the Members of the Association.

(*f*) Read letter No. C.S. 3741/02 from the Secretary to Resident-General to the Chairman, covering, for the information of the Association, a copy of the new agreement between the Straits Settlements Government and the British India Steam Navigation Company, Limited, for a special mail and cooly service between Penang and Madras or Negapatam.

The Chairman called attention to the fact that the agreement had been published in the *Selangor Government Gazette* of 11th July and said that all employers of labour should pay particular attention

to section 8, which he thought was not properly understood. This clause stipulates that all passages to be taken for coolies must be declared by the Superintendent of the Depôt 24 hours before the time fixed for the sailing of the steamer, and that passages so declared shall be paid for even if not used.

The Chairman, after giving the meeting a recent experience of his own, which had involved the loss to him of Rs. 154, stated that in this instance Dr. FOSTON had refused to apply for a refund of passage money although the Steamer Agents were agreeable to repay the amount. It was essential, he considered, that the risk of loss should be minimised in connection with recruiting operations, and he thought that the Government should be asked whether it was intended that Dr. FOSTON should adhere to the strict letter of the clause referred to, even to the extent of declining to *apply* for a refund. If Planters are to support the State-aided ticket system they must not be exposed to what would appear to be any unnecessary risk of loss; for, speaking for himself, he had never lost a single cent when he got his coolies over ordinary passage tickets, and he did not propose to incur any loss now if he could help it.

The Madura Company had acted as his Agents for some years now, but this was the first time that he had had to complain of any loss in this way. If the Government enforced this clause, he thought it would be cheaper to bring coolies over under the ordinary passage of Rs. 13.

Mr. MEIKLE, in supporting the Chairman's proposal, said that he did not think the Government would enforce the clause, seeing the risks the Recruiters ran of losing their coolies in Negapatam, from bolting, illness, and being induced to leave their original Recruiter through others offering better terms.

The meeting then unanimously agreed that a letter on the subject embodying these views should be addressed to the Resident-General.

(*g*) Read letter No. 2028/02 from the Acting Secretary to Resident, Selangor, to the Honorary Secretary, United Planters' Association, forwarding the following statement of "Coolies Imported by Railways and Public Works Departments" during the year 1901:—

STATEMENT OF COOLIES IMPORTED BY RAILWAYS AND PUBLIC WORKS DEPARTMENTS DURING THE YEAR 1901.

—	No. of Coolies landed at Klang.	Cost of coolies landed at Klang.		Average cost of each cooly landed at Klang.	
		$	c.	$	c.
Railway	1,732	43,840	11	25	31
Public works Department ...	514	12,166	38	23	67

(*h*) Read letter P. O. L. No. 295/1902 from the Protector of Labour, Federated Malay States, to the Honorary Secretary, United Planters' Association, asking the members of the Association what coolies they would probably require before 30th June, 1903, in case it was found feasible for the Government to undertake recruiting labour.

The Chairman said that as the Government seemed desirous of assisting immigration the Committee had thought it best that the Honorary Secretary should circulate a copy of the Protector of Labour's letter for members to answer individually.

Resolved that the Honorary Secretary should have Protector of Labour's letter printed and sent round.

(*i*) Read letter from Protector of Labour, Federated Malay States, enclosing the following statement extracted from the Annual Report of the Protector of Immigrants for 1900 for Natal.

NATAL STATISTICS SHOWING EMIGRATED COOLIES DURING 1900.

FROM MADRAS.

Steam Ship.	Date of leaving port of embarkation.	Date of arrival at Natal.	Embarked. Men.	Embarked. Women.	Embarked. Boys.	Embarked. Girls.	Embarked. Infants. Boys.	Embarked. Infants. Girls.	Total.	Born on board. Boys.	Born on board. Girls.	Total embarked and born on board.	Died on voyage. Men.	Died on voyage. Women.	Died on voyage. Boys.	Died on voyage. Girls.	Died on voyage. Infants. Boys.	Died on voyage. Infants. Girls.	Total.	Landed. Men.	Landed. Women.	Landed. Boys.	Landed. Girls.	Landed. Infants. Boys.	Landed. Infants. Girls.	Total.
	1900.	1900.																								
"Umzinto," XXI...	Jan. 22...	Feb. 10...	285	137	50	28	15	12	527	...	1	528	...	...	...	...	...	...	528	285	137	50	28	15	13	528
"Congella," XXX...	Feb. 27...	Mar. 21...	218	84	27	25	11	12	377	...	...	377	1	...	...	...	...	...	376	217	84	27	25	11	12	376
"Umkuzi," III...	May 8...	May 29...	339	119	33	17	17	11	536	1	1	538	...	...	...	...	...	...	538	339	119	23	17	18	12	538
"Umzinto" XXII...	„ 22...	June 12 .	304	126	31	31	21	16	529	...	...	529	...	...	...	...	...	...	529	304	126	31	31	21	16	529
"Pongolla" XXXII...	June 8...	July 2...	197	96	40	28	15	20	396	...	...	394	1	1	...	...	...	...	394	196	94	40	28	15	19	*392
"Umkuzi," IV...	July 25...	Aug. 14...	330	131	24	21	9	15	530	1	2	532	...	...	...	...	...	1	532	330	131	24	21	10	16	532
"Pongolla," XXXIII...	Aug. 28...	Sept. 21...	219	90	25	11	14	14	373	2	...	374	...	...	...	...		1	374	219	90	25	11	16	13	374
"Congella," XXXI...	Sept, 25...	Oct. 16...	213	91	24	22	11	14	375	2	...	377	...	...	...	...	...	...	377	213	91	24	22	13	14	377
"Umkuzi," V...	Oct. 10...	„ 30...	329	123	37	26	17	19	551	1	...	551	...	...	...	...	1	...	551	327	123	37	26	17	19	†549
"Pongolla," XXXIV...	Nov. 20...	Dec. 11...	214	88	30	20	70	12	381	...	...	381	...	...	...	...	...	...	381	214	88	30	20	17	12	381
"Congella," XXXII...	Dec. 5...	„ 27...	211	85	31	31	16	11	385	...	...	385	...	...	...	...	...	...	385	211	85	31	31	16	11	385
			2,859	1,170	352	260	163	156	4,960	7	4	4,971	2	1	...	...	1	2	4,965	2,855	1,168	352	260	169	157	4,961

* One woman and one infant disembarked at Madras just before sailing. † Two men deserted from steamer at Colombo.

FROM CALCUTTA.

Steam Ship.	Date of leaving port of embarkation.	Date of arrival at Natal.	Embarked. Men.	Embarked. Women.	Embarked. Boys.	Embarked. Girls.	Embarked. Infants. Boys.	Embarked. Infants. Girls.	Total.	Born on board. Boys.	Born on board. Girls.	Total embarked and born on board.	Died on voyage. Men.	Died on voyage. Women.	Died on voyage. Boys.	Died on voyage. Girls.	Died on voyage. Infants. Boys.	Died on voyage. Infants. Girls.	Total.	Landed. Men.	Landed. Women.	Landed. Boys.	Landed. Girls.	Landed. Infants. Boys.	Landed. Infants. Girls.	Total.
	1900.	1900.																								
"Umlazi" XII...	Mar. 14...	April 6...	317	140	7	5	7	5	481	2	...	483	4	3	...	...	1	1	474	313	137	7	5	8	4	474

REPORT OF THE PROTECTOR OF IMMIGRANTS.

VACCINATION.

Nine hundred and thirty-nine (939) successful vaccinations of Indians were made by the Indian Medical Officer and registered during the year in accordance with Law No. 3 of 1882 as against 550 in the previous year.

POPULATION.

The following return from the year 1876 to the 31st December, 1900, inclusive, gives the Indian population (introduced under the laws regulating the introduction of Indian immigrants) and the descendants of such Indians, births, birth-rate, deaths and death-rate for each year:—

Year.	Population.	Births.	Deaths	Birth-rate.	Death-rate.
1876	10,626	276	153	25·97	14·39
1877	12,668	184	184	14·52	14·52
1878	17,862	222	251	12·42	14·05
1879	19,008	232	191	12·15	10·04
1880	20,536	335	285	11·44	13·87
1881	22,900	513	384	22·31	16 07
1882	24,459	604	423	24·69	17.02
1883	27,021	974	482	32·34	14·13
1884	29,713	774	495	26·04	16·06
1885	30,159	760	491	25·19	16·28
1886	29,589	714	392	24·01	13·21
1887	28,944	828	410	28·60	14·16
1888	28,362	804	468	28·35	16·05
1889	30,355	806	517	26·05	17·03
1890	33,494	729	545	21·76	16·26
1891*	35,736	401	269	11·21	7·52
1891 and 1892 ...	38,365	966	617	25·17	16·08
1892 and 1893 ...	40,510	990	653	24·43	16·11
1893 and 1894 ...	42,967	1,117	569	28·99	13·24
1894 and 1895 ...	46,343	1,299	609	28·03	13·14
1895†	46,799	552	392	11·79	8·37
1896	49,643	1,399	718	28·18	14·46
1897	54,561	1.170	806	21·44	14·77
1898	59,858	1,143	856	19·09	14·30
1899	60,756	1,432	922	23·57	15·17
1900	65,925	1,429	1,030	21·67	15·62

* January to June, 1891. † July to December, 1895.

INCREASE AND DECREASE IN POPULATION.

The following figures show the approximate number of Indians in the Colony on 31st December, 1900, introduced under the provi-

sions of the law regulating such introductions and the descendants of such Indians :—

Estimated number, 31st December, 1899 ...			... 60,756
Arrived during the year	5,435		
Births	1,429		
		6,864	
Died during the year	1,030		
Left the Colony ...	665		
		1,695	5,169
			65,925

Of this total the following is the classification :—

	Men.	Women.	Children.	Total
Free Indians ...	17,008	8,659	18.843	44,510
Indentured Indians...	13,211	5,332	2,872	21,415
	30,219	13,991	21,715	65,925

(*j*) Read letter P. O. L. No. 316/02 from the Protector of Labour, Federated Malay States, to the Honorary Secretary, United Planters' Association, covering a letter from the Superintendent, Straits Settlements Emigration Depôt, Negapatam, regarding Canganies travelling to India from the Straits in other steamers than those of the British India Steam Navigation Company, and giving the names of some Canganies who had recently done so; also extract from a letter which had passed between Dr. Foston and Messrs. the Madura Company on the subject.

The Chairman said that he did not see any reason why Canganies and coolies should not go over in other steamers, especially when they have occasionally to wait some days in Penang for a British India boat, and he did not think that the fact that State-aided passages were arranged for by the Government with the British India Company for coolies coming from India was any reason why these people should be compelled to go to India by British India boats.

The Company presumably agreed to the reduced rates because they believed that the magnitude of the Government guarantee would prove a source of profit to themselves, and he (the Chairman) considered that if there be a question of employers being under any obligations to anyone, it is clearly to the Government, and not to the British India Company. The meeting unanimously took this view of the matter and the Honorary Secretary was asked to reply to the Protector of Labour accordingly.

4. Mr. E. R. Salisbury, of Gapis Estate, Perak, was elected a member of the Association.

5. General correspondence—

(*a*) Read letter from J. V. Brenchley in answer to a letter of the Chairman's asking for information about rubber cultivation in Mexico.

Resolved that the letter be forwarded to the "Agricultural Bulletin" for publication.

(*b*) Read letter from Mr. C. E. S. Baxendale to the Chairman regarding the Burmah Experimental Gardens and the planting of a large acreage of Para rubber, and suggesting that a question might with advantage be asked in the House of Commons. Also the Chairman's reply, suggesting that Mr. Baxendale should attend the meeting. But, as Mr. Baxendale was not present, it was decided to let the question stand over in the meantime.

(*c*) Read letter from Mr. Salisbury, Gapis Estate, Perak, to the Honorary Secretary, United Planters' Association, complaining of the high rate of freight charged on the Perak Railways on all kinds of coffee—cherry, parchment, or clean coffee—and stating that he is being charged 1½ % duty on copra, on a newspaper quotation, and not upon the rate at which it is actually sold.

The Chairman said that there were cases in Selangor where duty had been charged on coffee when the price was under $19, and that the duty so charged had been refunded; as regards this, no doubt the Perak Government would do the same, if a precedent was given. He suggested that Mr. Salisbury should refer the matter of duty on copra to Mr. C. Meikle, who is very much interested in coconut cultivation, and see what could be done.

Mr. Meikle said he thought the Government should be approached in the matter of allowing coffee in the cherry or parchment to be sent by railway at the lower grade of charges, for inferior goods, and that he thought it was very unfair that duty on copra should be charged at the newspaper quotation when the local price was so much lower.

Resolved that the Honorary Secretary write to Mr. Salisbury and give him the particulars of refund of the duty on coffee in Selangor, and suggest that he should communicate with Mr. Meikle and bring the question up again at a later meeting.

(*d*) The Chairman reported that the Honorary Secretary had received a draft for £3 7*s*. 8*d*. from Messrs. Sanderson and Co., London, being the balance due on the Aden shipment of coffee.

6. *Coconut Beetle.*—The following resolution was proposed by Mr. E. V. Carey and seconded by Mr. C. R. Meikle:

"That in view of the alarming spread of the coconut beetle pest the Government be asked to appoint a special European Inspector in each State, whose duty it shall be to see that the provisions of Enactment V. of 1898 are strictly enforced.

"That in the opinion of this Association, it is essential that all trees which have been badly attacked shall be deemed to be 'beyond recovery' and forthwith uprooted, split up and burned, unless the owner can satisfy the Inspector that such trees have been regularly attended to in the past and are at the time of inspection free of beetle.

"That for a second offence no excuse shall be expected by the Inspector.

"That the burying of uprooted trees should not under any circumstances be allowed, the Enactment being amended, if necessary to provide against this.

"That the Inspector should pay special attention to the enforcement of section 6 of the Enactment with respect to the breeding places of beetles.

"That all other palms which are infested by the coconut beetle shall be deemed to be 'breeding places' within the meaning of the Enactment and dealt with accordingly."

It was agreed to alter the draft resolution and to insert the word European before Inspector.

The Chairman said he was in a position to state that the High Commissioner had interested himself in the matter and it was satisfactory to know that he had his sympathy. As regards the breeding places of the beetle he considered that all rubbish heaps, serdang, and sago trees where the beetles are known to breed should be treated as such, and that uprooted trees should on no account be buried.

There seemed to be no complaint of beetle in either Negri Sembilan or Perak, and he thought that when the Enactment was properly carried out Selangor would also be free from them.

Mr. MEIKLE said that he concurred entirely with what the Chairman had said, but if the matter was not taken in hand at once he was afraid that coconut cultivation would be impossible. He went over an estate a few days previously which was covered with dead serdang and other palms in which the beetle breeds, but the coconut trees showed no signs whatever of being attacked, proving that if the pest is taken in hand at once there need be no fear of the beetle attacks becoming dangerous.

Meeting terminated at 1.30 p.m.

For the Committee,

HERBERT M. DARBY,

Hon. Secretary, U. P. A., F.M.S.

A LARGE INDIAN MELON.

A very fine fruit of the Indian Melon (*Cucumis melo* var momordica) was grown at Government House, Singapore, in sandy soil. It was dark green mottled with lighter colour, and weighed sixteen pounds and a-half with a length of 2 feet 3 inches and a circumference at the broadest end of 1 foot 10 inches. It had not much flavour but is said to be very wholesome and is an important article of food in India.

H. N. R.

FICUS BRACTEATA.

Editor,

In reference to your note in August Bulletin in regard to *Ficus bracteata* there is a big spreading tree of this in the Kuala Lumpur Gardens, just a little way past the plant house. It was evidently growing there before the ground was converted into a garden. I collected specimens from this last May, and noted at the time, "large spreading tree." If you are that way again, look for it and you will see there is nothing of the shrub about the old veteran,

C. CURTIS.

Rubber, a new industry in Guatemala.

From the Diplomatic and Consular report on Guatemala for 1901, the following is extracted :—

The cultivation of the rubber tree and the export of the product is a growth entirely of the last few years, and it is undoubtedly an industry which is admirably suited to the coast districts of the Republic, and should more than make up for the apparently permanent falling-off in the coffee-growing industry. Coffee, it has now been found may be grown with ease in all countries when a certain temperature prevails, and the consumption does not increase in proportion to the supply; while, on the other hand, good rubber is as yet only obtainable in a few parts of the world, and the demand increases every day, and this demand seems likely to go on increasing with every new invention and improvement in almost every branch of the manufacturing industries.

It is therefore worth the while of those who are considering the advisability of a planter's life in tropical countries, to enquire into the details of rubber planting, at any rate, so far as Central America is concerned, where concessions of land are easily obtainable at very cheap rates, and where the huge markets of the United States lie so close at hand.

It must be remembered, of course, that the returns are considerably longer in coming in than in many crops, for rubber takes ten years to yield a full crop. A person thoroughly acquainted with these subjects recently explained to me that the method he would follow would be to plant a grove of, say, 100,000 plants, which at the end of five years would yield a certain crop, say one-third of what fully matured trees should yield. At the end of the fifth year, the plants should be thinned down to half their number, or 50,000, on these 50,000 trees of five years old a handsome sum would be realised which would entirely repay the original outlay, the running expenses being paid by the cultivation of some such fruit as the banana, thus leaving the planter at the end of five years with all his outlay paid, and a grove in his possession yielding a larger product every year, and the expenses of his plantation paid by the secondary crop of bananas.

INSECT NOTES.

The following insects were found attacking the Gutta percha plants planted out on the slopes of Bukit Timah, and were identified for me by Mr. C. O. WATERHOUSE of the British Museum.

Dalpada oculata, Fr. (Hemiptera) a shield shaped bug ¾ inch. long and ¼ inch. broad, antennœ very slender 5 jointed joints long black minutely hairy, bases of the upper joints white. Head narrwly oblong blunt, eyes prominent. Thorax triangular with two short processes at the basal angle, broad. Scutellum triangular large with the two upper corners smooth and conspicuously creamy white. The transparent ends of the elytra blackish. The head, throax and wings otherwise are brown in appearance, but under the lens are cream colour or brownish cream colour densely dotted with round black pits. Forelegs not very long, hairy, bases reddish, joints and tips black. Body beneath dirty reddish and olive yellow colour. Beak long slender black half the length of the body. The abdomen above is black and red, projecting beyond the wings when they are closed.

This is a very common shield bug, occurring also in India. It sucks the sap of the plants with its long beak and so injures them.

Cetonia mandarinea, is a small chafer about half an inch long dark brown elegantly reticulated with gold. It is very common and my attention was called to it at the Residency in Malacca, where numbers were to be seen on rose and other bushes where it was eating the leaves. I was puzzled to know whence it came, when I observed that the Cannas grown in tubs hard by were become very weak and shabby. The gard ners were changing the earth in the tubs, and on examining this I found it swarming with grubs of this beetle. The grubs are about an inch long when full grown, of the usual form of all the grubs of beetles of this group dirty white in colour, with a thickened tail, and powerful chesnut coloured head and jaws. They had been devouring the roots of the Cannas and so caused their deterioration, I have previously seen the same insect in tubs of palms which they had injured in the same way. I believe that they are first attracted by manure put into the tubs with the soil. In cases where such plants in tubs or large pots deteriorate and get weak from no visible reason, the soil should be cleared out and these grubs looked for.

A dead-leaf cockroach *Epilampra deplanata,* Walker, was also found on the plants and as its mouth was full of gutta, it seemed certain that it had been biting the plants. The animal is a large flat cockroach of a light brown colour, the colour of dead leaves. It is not very rare here as I remember to have taken it before, among dead leaves and on bushes, but Mr. WATERHOUSE says there is only one other specimen in the British Museum but that it may be only a variety of *E. Congrua.* Very little is I believe known as to the habits of these large jungle cockroaches, but they are generally to be found hiding between leaves of bushes, flying off quickly when disturbed and concealing themselves among the dead leaves on the ground.

Louchodes breerpes, Gray, is a long rather slender plain brown stick-insect. It was caught on the Gutta plants, and as these insects are leaf-eaters, it was probably devouring the leaves.

REPORT ON THE BEAUMONT ESTATE

By Mr. S. Arden.

BATU TIGA,
Selangor, 2nd October, 1902

Sir,—Acting under instructions conveyed in your letter No. Misc. 5960/02, I have the honour to inform you that I proceeded to Klang on the 26th ultimo and in company with Mr. E. V. Carey, inspected the Beaumont Estate. The instructions received do not specify any particular object in making this inspection. but I learn from Mr. Carey that it was with a view to enabling me to record my opinion as to the suitability or otherwise, of the peculiar soil of this district for the cultivation of Ficus elastica (rambong), and my remarks are thetefore chiefly confined to this subject.

2. The Estate is situated some 6½ miles from Klang by which it is connected by a Government Road, within the reaches of a large stretch of flat country, the soil of which is presumably of a similar nature to that of the Estate under note.

This soil is a peat of considerable depth, and I am informed that clay has never been reached, although judging from the peat soils of other Estates in the neighbourhood, which have been opened some time, fancy that in a very few years, a subsoil of clay will be found within a few feet of the surface.

3. The Estate is about 170 acres in extent, about 85 acres of which are devoted to the cultivation of 'rambong.' This may be roughly divided into three sections:—(*a*) Trees 19 months old, planted 30 feet by 30 feet (about 48 trees per acre) which were roughly estimated to average 16 feet in height and 24 feet through the crown, a wonderful growth for trees of this age, approximating that of trees twice the age when grown on hill land, though even under these conditions the tree grows with great rapidity.

(*b*) Trees 16 months old, the same distance apart, from 10-12 feet high and about 15 feet through the crown.

(*c*) Trees about 12 months old, having an average height of about 9-10 feet and a crown diameter of about 10 feet, also planted 30 feet by 30 feet.

A comparison of the dimensions given above will shew that the rate of growth is equal to about 10 inches in height and 15 inches in diameter per mensem, which cannot be characterized otherwise than as marvellous. The whole sheet of rubber presented a most even appearance, the bright red stipules surrounding the unexpanded leaves, contrasting with the deep green foliage and making a perfect picture, of luxuriant growth.

In addition to the trees mentioned above, there are about 5 acres of 3 year old trees, whose growth had been checked by fire some time ago, but which are now looking remarkably healthy.

4. In a few instances the rows had been extended into a sandy soil at the foot of a hill, and the difference in the rate of growth between trees planted in peaty soil, and trees of the same age planted in sandy soil, was most noticeable, the latter not being much more than half the size of those mentioned above.

The trees were all grown from rooted cuttings which were about 18″ high when planted.

5. Soils such as the one described above, contain a high percentage of nitrogen, but, when newly opened, are generally very sour, owing to the large amount of stagnant water they contain; which, by excluding the air from the soil has prevented proper oxidation, resulting in an accumulation of acids injurious to plant life.

The highly retentive properties of peaty soils necessitates a much more elaborate system of draining than is generally practised when opening up new agricultural land, as it is necessary to rid the soil of this surplus moisture and the acids it contains in solution. Heavy applications of lime are also beneficial as they neutralise the effects of the acids, and thereby render the soil "sweet" and fit for the cultivation of plants; while burning the soil, although attended with a loss of nitrogen, is recommended on the grounds that it increases the supply of avaialble mineral plant food, which is usually deficient in peaty soils.

6. It is apparent, from what has been said above, that this class of soil, although persistently condemned for the cultivation of other products, is eminently suited to the growth of Ficus, which, due to its epiphytic nature is able to obtain its necessary food supplies close to the surface, and thus avoids coming in contact with the injurious acids previously referred to.

I have the honour to be,
Sir,
Your obedient Servant,
(Signed) STANLEY ARDEN,
Superintendent Experimental Plantations.

PARA RUBBER STUMPS.

PLATE VIII.

In this number we give an instructive photograph taken at Kong Baik Estate in September 1901, shewing Para rubber trees grown from stumps. That is to say, tall young trees removed after about a year or two's growth. As will be seen, the tops of the trees have been cut off and the plant allowed to throw out side shoots. Trees of almost any size can be shifted in this manner, and rarely fail to start growing again. It is essential to cut the tops off when planting, as newly planted stumps with the full head on, are apt to be so much shaken by the wind, that the new young roots cannot retain their hold in the soil and are constantly broken. The stumps very soon begin to throw up shoots from the top or rather just

Kong Taik Estate.

Para: 10′ × 10′, planted, November 1900. Big Stumps.

below it, and sometimes much lower down. It is advisable to remove all the lowest shoots in this case, and leave only one or two at the top. The greatest risk to the plants is from the wet and fungus attacking the cut top, and eating downwards. This seldom happens in the case of stumps an inch or so through at the top, but is not common in really big stumps. Care must be taken in cutting the tops off to cut a clean smooth, and by preference, sloping surface. No splits in the top must be allowed.

Planting by stumps is especially useful where for any reason the ground for the future plantation cannot be got ready in time for the planting out. The young trees can be grown close together in a nursery for a whole year and then planted out as stumps.

H. N. R.

CORRESPONDENCE.

FICUS ELASTICA.

To the Editor

AGRICULTURAL BULLETIN, SINGAPORE.

SIR,—I have read with much pleasure the notes on the "Rambong" grown in Assam by the Indian Government.

As I have seen this plantation it interests me all the more.

The amount of rubber extracted from the trees must be a great blow to the Indian Government as they told me they expected from 2 to 6 lbs. per tree at least.

Mr. Copeland's report can be taken as true in every way, he was there during my visit in 1896 and took immense interest in the plantation.

I fancy Mr. Mann's figure of trees planted in lines 100 feet apart and cleared for a width of 40 feet must be wrong unless this is a new system, as if the trees were only 25 feet apart it would allow for little growth, 70′ × 35′ is what I remember as correct which I believe gives 17 trees per acre.

A point which I wish our planters to notice is that the crown diameter measurements run up as high as 100 feet. Of course I do not say all trees will grow so big but it seems to point to the fact that one chain apart is probably near enough.

The system of cutting lines in our jungles I have given a good trial to and am convinced it is a mistake, so much so, that after planting this way and finding the growth of the plants almost nil, I clear felled 60 acres and after reclearing the lines and putting in fresh plants "(where the others had been killed by the falling trees)" the result was at once evident, the sun and light brought on the plants and this block of land can now compare favourably with any other I have planted.

Although the Assam soil is very good, our growth for Ficus Elastica is fully equal to anything they can show us, and as per Mr. Derry's figures they are not in the same street with them as in regard to yield. This may be in a way accounted for by the long

dry season up there which often dries up the young branches and no doubt adversely injures the yield of the trees.

I have also heard it whispered that the theft of rubber during the tapping operations is enormous, it being very easy for the natives to do this without detection; especially so as the surrounding jungles contain indigenous trees in native territory. If this was not so, what occasion to use coal tar to mark the Government tapping cuts? but it is easy for the native to use tar also, perhaps that has not struck the Ind an Government.

I think I might mention that the Indian Government tried what they called the "nature treatment" of Rambong and planted a large area of forest land up in the branches of trees. I saw a number of these plants still where they had been placed over twenty years previously, but as far as I remember in only one case had the roots reached the ground. I think the reason was they sent out tender aerial roots which each dry season withered up and died off so that every rainy season they had to make fresh efforts which was never successful from say a height of 40 feet. The plant I mentioned as growing into the ground had been planted in a fork only about 9 feet above ground.

The planting of large plants 10 to 12 feet high on mounds is unnecessary here if the area is clear felled and kept moderately clean as we have very few deer to eat up the plants.

Yours faithfully,

A. B. STEPHENS.

LABOUR SUPPLY.

VALLAMBROSA ESTATE, KLANG,
Selangor, F. M. S., 19th September, 1902.

CIRCULAR:

DEAR SIR,—I have been directed by my Committee to circulate the following letter from the Protector of Labour, Federated Malay States, and to ask you to let me have an early reply to the questions contained therein:—

I am, dear Sir,

Yours faithfully,

HERBERT M. DARBY,
Hon. Secretary, U.P.A., F.M.S.

OFFICE OF PROTECTOR OF LABOUR, F.M.S.

P.O.L. $\frac{295}{1902}$ — *Seremban, 30th June, 1902.*

TO THE SECRETARY,

UNITED PLANTERS' ASSOCIATION, KAJANG.

SIR,—I should be obliged if you will inform me (1) how many Indian labourers the members of your Association require before the 30th June next, probably; (2) if your members are prepared to have any fixed number allotted to them should the Government be able

to give them a supply; (3) the terms your members are prepared to offer for their requirements; and (4) the rates at which they will agree to supply provisions.

2. The object in asking for information is that, if found feasible for the Government to recruit, the Resident-General may be able to ascertain what steps are necessary to put the labour supply on a more satisfactory basis, and what requirements actually are.

3. You will, I am sure, understand that the Government could not undertake to recruit for hundreds of employers on ever-varying terms.

4. In addressing your Association, it is the assumption that such labourers would be required for estate works and recruited on that understanding.

I have the honour to be,

Sir,

Your obedient Servant,

(Sd.) T. H. HILL,

Protector of Labour, F.M.S.

VALLAMBROSA ESTATE, KLANG.

Selangor, F.M.S., 15 September, 1902.

DEAR SIR,—As the question of export duty on dry cherry and parchment coffee is likely shortly to engage the attention of your Association, I shall be much obliged if you will favour me with particulars of weights and measurements in connection with *both* heaped and cut Government tins of fresh cherry.

	P.	C.
5 tins cherry weight		
„ after thorough unbroken drying weight ...		
„ measurement in tins to show loss in drying		
Outturn in clean coffee No 1.		
„ „ broken		
„ „ blacks		

By the expression "unbroken" it is meant that the cherry should be dried as far as possible, whole. It is desirable that we should have particulars with respect to both heaped and cut tins, the former being more generally used for purposes of trade, and the latter being, of course, the more accurate.

I am, dear Sir,

Yours faithfully,

HERBERT M. DARBY,

Hon. Secretary, U.P.A., F.M.S.

KLANG, 23RD OCTOBER.

THE EDITOR,

Agricultural Bulletin, Singapore.

Dear Sir,—Please find herewith a letter from Mr. C. E. S. BAXENDALE of Jugra, which I venture to think will prove very interesting reading to many of your readers.

The question of the maximum yield of our Para trees, if advertised in this manner, ought to attract attention from far outside the Malay Peninsula!

I am dear Sir,
Yours Faithfully,
E. V. CAREY.

YIELD OF PARA-RUBBER TREES.

JUGRA ESTATE.
Selangor, October 21st, 1902.

The Editor,

THE AGRICULTURAL BULLETIN.

DEAR SIR,—Can you tell me what is the record yield of a Para rubber tree for one year?

By this mail I have despatched to Liverpool, parcels containing 26 lbs. of clean rubber and 3 lbs. of scrap, the result of two months (exhaustive) tapping of two trees growing in Mr. SALISBURY'S garden at Gapis Estate, Perak. The trees are said to have been planted by Sir HUGH LOW 19 or 20 years ago, on what Mr. SALISBURY considers to be the poorest soil possessed by the Kuala Kangsar Plantations Co.

Tree No. 1.—Girth at one yard from ground 89 inches. Never previously cut. I worked this tree from three channels (beginning with a three cornered chisel and going on with my pruning knife) and the first days yeild was just one ounce of rubber. During the next five days 1½ lbs. was the result. Then the yeild rapidly increased, the daily average for ten days exceeding half a pound. The maximum, twelve ounces, was reached at the twelth day from commencement. At the end of July, I left Gapis, and Mr. SALISBURY continued the work with occasional intervals until September 18th.

	lbs.	ozs.
Yeild of clean rubber (after from one to three months drying)	15	12
,, ,, ,, ,, ,, ,, Scrap	2	4
Total lbs.	18	0

Tree No. 2.—Girth at one yard from ground 56″ (yeilded 3 lbs. during July, 1901).

Except that we worked this from two channels instead of three the method was the same.

			lbs.	ozs.
Yeild of clean rubber	...	...	11	2
„ „ Scrap	...	...	1	8
		Total lbs.	12	10

Assuming that Mr. SALISBURY'S time was the same as mine, about 70 hours were occupied in tapping collecting and drying.

"Scrap" was not kept separate. I have calculated it in proportion to the number of channels.

I have etc.,

CYRIL E. S. BAXENDALE.

NOTE.—This is truly a record yield, I have not heard of anything to beat it, except marvellous records in various South American prospectuses, which may be considered as doubtful. The trees I presume were those planted by Mr. Murton, the Superintendent of the Botanic Gardens in Singapore in October, 1877, 9 Heveas and 1 Castilloa were taken to Perak by him and planted at Kuala Kangsa.

Sir Hugh writes of them, 26th July, 1878: "They were quite small when they arrived here but the Castilloa is now 5 feet tall and the Heveas vary from 4 to 8 feet," and later, February 3, 1879, "The Heveas are now 12 to 14 feet high. They take to the country immensely." The Castilloa which was then 10 feet tall seems to have perished long ago.

If these are the trees which produced the yield mentioned by Mr. Baxendale they are now just 25 years old.—*Editor.*

REPORT ON TWO SAMPLES OF RUBBER RECEIVED FROM BUKIT RAJAH, 12TH AUGUST, 1902.

We have carefully examined the samples of Rubber you have sent and have shown same to our friends. The quality is good and the Rubber is hard and clean, though a little barky. It should be worth about 2/4-2/5 per lb., and would probably be liked by manufacturers in quantity.

There is practically little, if any, difference between the two samples. The darker is perhaps a little more barky.

The Editor,

Agricultural Bulletin:

Dear Sir,

The above is a report and valuation from London in connection with the Ficus Elastica rubber from a tree on Bukit Rajah Estate, Klang, aged 4 years and 1 month at time of tapping. I venture to

think that the price quoted is distinctly good having regard to the age of the tree.

I am, dear Sir,
Yours faithfully,
E. V. CAREY.

LANADRON ESTATE,
Muar, September 24th, 1902.

To the Editor,
AGRICULTURAL BULLETIN.

Dear Sir,

re Coagulation of Rubber.

I hope you will pardon me for referring to this matter again as I see in the last issue of the "Bulletin" you published my correspondence with the "India Rubber and Gutta Percha Journal." I have no information to offer and for this reason am anxious to draw attention to the subject, which appears to me to have been somewhat neglected. Now that some estates here are nearing the producing stage, it is of vital interest to all rubber planters that the first consignments home produce a good impression. Of the samples already sent home, some have and some have not been reported upon favourably and in no instance, that I am aware of, has the price exceeded that of fine Para, which we are told contains 15% to 18% of impurities. This points to the fact that, at any rate, no satisfactory method of coagulation is generally known. Several methods have been recommended from time to time, but is it sure that any of these bring the rubber to such a state of purity that the manufacturers will suffer no loss from washing? I am of opinion that experiments (co-operative or otherwise) should be carried out until all rubber planters here are in possession of a method by which this happy result can be obtained.

The reply to my letter in the last Bulletin, already referred to, was written by Dr. CARL WEBER, an eminent chemist, whose speciality is rubber and gutta. The treatment he mentions as not being public property, will shortly become so, as he is at present on a mission to Central America in connection with the coagulation of rubber, and the results of his investigations and moreover this treatment will be published in full in the "India Rubber and Gutta Percha Journal." These articles should contain most useful information, well worth the attention of all planters and the methods described, tested to ascertain whether they are applicable to this country.

Referring to the extract from the "India Rubber and Gutta Percha Journal" giving the analysis of a sample of a rubber obtained in the Malay States, from a Hevea plantation, it would be extremely interesting if some of your readers could inform us as to its origin and also method of coagulation.

Hoping that this letter may call forth some expressions of opinion on this subject.

Yours faithfully,

FRANCIS PEARS.

VALLAMBROSA ESTATE,
KLANG, SELANGOR, F. M. S.
September 19th, 1902.

THE EDITOR,
AGRICULTURAL BULLETIN, SINGAPORE.

DEAR SIR,—I am directed by my Association to forward you the enclosed letter from Mr. J. V. BRENCHLEY regarding Rubber cultivation in Mexico, and to ask you to publish it in the next issue of your paper.

Yours faithfully,

HERBERT M. DARBY,
Hon. Secretary, U.P.A., F.M.S.

FICUS ELASTICA.

BRITISH CLUB,
Apartado 423,
Mexico City, April 17th, 1902.

DEAR SIR,—Mr. JEROME, H. B. M. Consul here has asked me to answer yours of 24th October last and I lost the letter and your address, but it has turned up again and I will tell you what I know about the rubber culture here in which I am much interested myself.

The wild Rubber of the hot country in Mexico is "Castilloa Elastica" and that is being planted on nearly if not all the estates to which the Consul refers; there are other rubbers in the country though they do not grow to any great extent. "Ficus Elastica" is also to be found and grows up here at the altitude of over 7,000 feet but naturally yeilds nothing nor is it tapped and there are three other varieties growing in the great square of this city but nobody taps them, neither is it allowed, however, I slashed one to see what it would give and I got a very nice specimen of rubber out of it. On one of my own places in the State of Chiapas on the Pacific coast I planted last year a quantity of "Manihot Glasiovii" which grows on stony ground and originally comes from Brazil and requires very little water but I planted it because it grows up to 3,000 feet and with our enormous rainfall on that coast (170 inches in the year) it ought to do very well. I have no idea of the number of the rubber plantations now being planted nor their acreage as there are so many lies told about them, but if you will look at the map of Southern Mexico you may take it that the lower halfs of the States of Oaxaca, Veracruz, nearly all Chiapas and all Tabasco are suited for rubber and as there are a great many people planting, you may get

a small idea of what is being done now, but there are a great many swindles in connection with it, labour on the whole is scarce. In some districts it is better than others, at my own places I pay $0.50 Mexican per day but we try and do all the work by task which is much more satisfactory, transport is another question that prohibits men starting plantations far away from the main roads and navigable rivers.

I am going down to the hot country soon, to the Northern end of the State of Chiapas close to San Juan Baptista and if you care for further local information I shall be pleased to give it you, the address at the head of this will allways find me and my letters are forwarded from the City to wherever I am at the moment; we think that Mexico will show up very well in a few years in the rubber market but naturally we are prejudiced, we tap after the tree is 6 years old and every tree should give 1½ pounds of dried rubber in the season, not milk, and we plant as much as possible in the open and not under shade having found by experience that the shade brings up the sapling very quickly but very thin and with no branches at all, while in the open the tree begins to put out branches from the beginning and is a nice healthy looking tree after it has passed the first year in its definite place in the plantation.

Yours truly,

J. V. BRENCHLEY.

RAINFALL IN SINGAPORE.

BY A. KNIGHT.

DEAR SIR,—I understood you to say that you arrived here in 1888, and that this was the driest year since. It so happens that 1888 was itself one of the driest years on record. This is a list of the 7 dry years—*i.e.* in which the rainfall was under 80 inches—since I first kept a complete record:—

1868.	75.55	1885.	67.32
1872.	75.30	1888.	65.56
1877.	58.37	1896.	74.07
1883.	70.14		

The first is my own record at Mount Pleasant. The others are from the official returns, which commenced to be published, though not in their present complete form, for 1871. These figures represent the average for each year of the returns from the various stations in Singapore, but these are taken as correct without examination. In 1877 there is clear evidence that some of them were incomplete, and the true average would probably be about 65 inches.

For the present year my own record is as follows :—

January,	17.91	
February,	7.74	
March,	4.33	
April,	8.71	
May,	4.11	
June,	5.15	
		47.95
(the average for a year, over a long series of years, being rather under than over 90)		
July,	2.16	
August,	4.05	
September,	4.55	
		10.76
October, so far		2.79
		61.50

The total for the year therefore promises to be higher than in 1888. Of course, when water supply has to be considered, much depends on the nature and frequency of the rain as well as the total quantity. In 1888 there were repeated long droughts, and the only months in which the fall was not below the average were May and September, while the number of rainy days was only 128, the lowest number but one recorded. This year I have so far registered rain on 138 days.

As regards the mist, if it were water, surely it would produce profuse dew and general damp, but the contrary is the case.

Yours truly,

A. KNIGHT.

NOTICES.

(1).

The Para Rubber trees in the Botanic Gardens, Singapore, are now commencing to produce the seed crop. Planters who have put their names down in previous years for seed, and no longer want any, are requested to write to the Director to inform him.

(2).

Correspondents are requested to stamp their letters fully, as a large number of letters have been received from various parts of the world either not stamped at all, or insufficiently stamped.

(3).

All applications for Bulletin should be made to the Editor who will also receive subscriptions.

SINGAPORE MARKET REPORT.

September, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	56	30.50	29.00
Bali	70	24.00	22.00
Liberian	279	20.00	19.50
Copra	3,866	9.65	8.30
Gambier	2,387	15.50	14.17½
Cube Gambier, Nos. 1 & 2	160	23.50	19.00
Gutta Percha, 1st quality	...	450.00	300.00
Medium	...	300.00	150.00
Lower	...	150.00	50.00
Borneo Rubber	...	137.00	70.00
Gutta Jelutong		6.50	5.87½
Nutmegs, No. 110's	...	47.00	45.00
No. 80's	...	83.00	78.00
Mace, Banda	...	86.00	85.00
Amboyna	...	105.00	95.00
Pepper, Black	195	36.50	35.75
White	449	54.50	52.00
Pearl Sago, Small	195	5.45	4.90
Medium	...	6.00	5.40
Large	...	6.50	5.50
Sago Flour, No. 1	2,100	4.00	3.70
No. 2	390	2.00	1.65
Flake Tapioca, Small	742	7.00	4.30
Medium	95	5.50	5.00
Pearl Tapioca, Small	563	6.50	4.35
Medium	1,047	6.87½	4.30
Bullet	...	5.40	5.00
Tin	2,365	80.70½	78.87½

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th October, 1902.

Wired at 4.25 p. m. on 16th September, 1902.

		Tons Steamer.
To England:		
Tin	from Singapore & Penang to England - and U. K. optional any ports	925
Gambier	from Singapore to London -	30
,,	,, ,, to Liverpool-	...
,,	,, ,, to U. K. &/or Continent -	875
,,	,, ,, to Glasgow -	20
Cube Gambier	,, ,, to England -	60
White Pepper	,, to ,, -	90
Black Pepper	,, ,, to ,, -	...
White Pepper	,, Penang to ,, -	20
Black Pepper	,, ,, to ,, -	...
Pearl Sago	,, Singapore to ,, -	80
Sago Flour	,, ,, to London -	650
,,	,, ,, to Liverpool -	...
,,	,, ,, to Glasgow -	...
Tapioca, Flake	,, S'pore & P'nang to England -	250
,, Pearl & Bullets	,, ,, to ,, -	310
,, Flour	from Penang to ,, -	100
Gutta Percha	from Singapore to England - -	50
Buff hides	,, ,, to ,, - -	40
Pineapples	,, ,, to ,, -	cases 5,500
To America:		
Tin	from Singapore and Penang - -	530
Gambier	,, Singapore - -	200
Cube Gambier	,, ,, - -	50
Black Pepper	,, ,, - -	160
,,	,, Penang - -	180
White Pepper	,, Singapore - -	20
,,	,, Penang - -	50
Nutmegs	from Singapore and Penang - -	32
Tapioca, Flake and Pearl	,, ,, ,, - -	400
Pineapples	,, ,, -	cases 500
To the Continent:		
Gambier	from Singapore to South Continental Ports	20
,,	,, ,, ,, North ,,	330
Black Pepper	,, ,, ,, South ,,	...
,,	,, ,, ,, North ,,	...
,,	,, Penang ,, South ,,	40
,,	,, ,, ,, North ,,	...
White Pepper	,, Singapore ,, South ,,	...
,,	,, ,, ,, North ,,	60
,,	,, Penang ,, South ,,	...
,,	,, ,, ,, North ,,	50

			Tons Steamer.
Copra	from Singapore & Penang to Marseilles		1,100
”	” ” ,, Odessa		...
”	” ” ,, South Continental Ports		660
	other than Marseilles and Odessa.		
”	” ” ,, North Continental Ports		520
Tin	,, ” ,, Continent		320
Tapioca Flake	,, ” ” ”		110
Tapioca Pearl	,, ” ” ”		300
Cube Gambier	,, Singapore to Continent		190
Pineapples	,, ” ” ”	cases	20

N.B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,600 tons Gambier
130 ,, Black Pepper
(*in Singapore*)
contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E.C.

Singapore.

Abstract of Meteorological Readings for the month of September, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall,	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·898	139·9	80·5	87·6	73·1	14·5	77·4	·869	75·2	78	S. E.	3·47	0·86

K. K. Hospital Observatory,
Singapore, 16th October, 1902.

A. B. LEICESTER,
Meteorological Observer.

W. GILMORE ELLIS,
Acting Principal Civil Medical Officer, S. S.

Penang.

Abstract of Meteorological Readings for September, 1902.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·900	144·6	79·8	88·5	73·8	14·7	74·9	·775	69·81	71	N.	11.55	2·28

Colonial Surgeon's Office,
Penang, 9th October, 1902.

G. D. FREER,
Acting Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for September, 1902.

	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
General Hospital.	29·832	152·5	82·8	89·9	70·3	19·6	81·7	1·083	60·5	94	W.	7·51	2·18

Colonial Surgeon's Office,
Malacca, 7th October, 1902.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for September, 1902.

Districts.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Wind.	Total Rainfall
			Maximum.	Minimum.	Range.	Mean wet Bulb.	Vapour Tension.	Humidity.		
Taiping ...	155	82·93	93	71	22	77·46	·870	77	12·14	3·26
Kuala Kangsar ...	...	80·55	93	70	23	75·96	·838	80	3·87	1·12
Batu Gajah ...	162	81·32	93	71	22	76·94	·871	82	8·13	1·36
Gopeng ...	...	81·06	92	65	27	76·54	·853	80	7·08	1·52
Ipoh ...	...	81·03	93	71	22	76·44	·854	81	7·32	1·82
Kampar ...	...	...	92	69	23	...	...	...	10·43	2·20
Teluk Anson ...	...	81·24	92	70	22	77·18	·875	83	4·17	1·36
Tapah ...	..	80·83	94	68	26	76·39	·850	80	12·33	2·46
Parit Buntar ...	...	82·66	94	71	23	77·52	·877	79	5·20	1·50
Bagan Serai ...	...	81·84	92	69	23	76·92	·862	79	5·57	1·74
Selama ...	...	82·29	92	71	21	77·88	·882	81	4·63	1·12

STATE SURGEON'S OFFICE,
Taiping, 9th October, 1902.

W. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for September, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General Hospital, Kuala Lumpur	29·888	145·7	80·9	90·6	71.6	19·0	76·7	0·829	73·6	79	Calm	8·60	2.70
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	8·74	3·13
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	5·48	2·06
,, Klang	...	...	...	85·7	75·1	10·6	...	...	...	...	...	3·34	1·72
,, Kuala Langat	...	...	...	84·8	72·6	12·2	...	...	...	...	...	4.52	1·16
,, Kajang	...	...	...	86·1	75·7	10·4	...	...	...	...	...	2·50	1·62
,, Kuala Selangor	...	...	...	85·9	76·7	9.2	...	...	...	...	...	1·57	0·63
,, Kuala Kubu	...	...	...	91 9	72·4	19·5	...	...	...	...	...	14.51	2·70
,, Serendah	...	...	...	88·7	76·1	12·6	...	...	...	...	...	7·44	2.38
,, Rawang	...	...	...	86·3	73·3	13·0	...	...	...	...	...	9·32	2.02
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	3·58	2·15

State Surgeon's Office,
Kuala Lumpur, 13th *October*, *1902*.

E. A. O. TRAVERS,
State Surgeon, Selangor.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for Septembr, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Pekan, District H'pital	...	...	...	81.1	73.3	15.6	...	...	...	...	...	5.93	1.56
Kuala Lipis - -	...	...	8.27	95.0	70.5	24.5	...	...	...	...	...	9.40	2.05
Raub - - -	...	...	81. 3	95.0	70.0	19.3	...	...	...	...	...	6.49	1.47
Bentong - - -	...	...	82. 0	94.0	70.0	24.0	...	...	...	...	...	9.16	1.58
Kuantan - - -	...	...	...	87.	71.	16.	...	...	...	...	...	9.79	3.70
Temerloh - - -	...	...	...	93.	71.	22.	...	...	...	...	...	5.24	1.24

Pahang, 1st October, 1902.

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Singapore.

Abstract of Meteorological Readings for the month of October, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F.	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·905	138·0	79·9	87·6	71·6	16·0	77·1	·864	75·1	78	S. E.	2·20	0·63

K. K. Hospital Observatory,
Singapore, 15th November, 1902.

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S. S.

Penang.

Abstract of Meteorological Readings for October, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·902	144·6	80·4	89·2	74·3	14·9	75·6	·798	71·0	71	N.W.	9·52	1·54

Colonial Surgeon's Office,

Penang, 7th November, 1902.

G. D. FREER,

Acting Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for October, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
General Hospital.	29·857	150·9	82·1	88·8	69·09	19·8	80·8	1·033	62·7	93	E.	7·75	2·48

Colonial Surgeon's Office,
Malacca, 11th November, 1902.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
General H'pital Pekan,	...	...	...	92°	72°	12·0	...	...	...	...	...	3·89	·85

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Pekan, 4th November, 1902.

Muar.

Abstract of Meteorological Readings for October, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	77·0	92·0	71.0	21·0	73·5	...	...	...	...	7·85	1·48

Muar, 1st November, 1902.

FRANCIS PEARS.

No. 14.] DECEMBER, 1902. [VOL. I.

AGRICULTURAL BULLETIN
OF THE
STRAITS
AND
FEDERATED MALAY STATES.

EDITED BY
H. N. RIDLEY, M. A., F. L. S.,
Director of Botanic Gardens and Forests, S. S.

CONTENTS.

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NOTICE.

THE SCIENTIFIC AND TECHNICAL DEPARTMENTS OF THE IMPERIAL INSTITUTE.

His Excellency the Governor has received a despatch from the Right Hon'ble the Secretary of State for the Colonies calling attention to the advantages offered by the Imperial Institute to Merchants, Planters and others, who may wish to have samples submitted to scientific experts for opinion as to their commercial value, etc. The following extracts from a Memorandum published by the Authorities of the Imperial Institute will give an idea of the work undertaken and carried on there.

"The Scientific and Technical Department of the Institute has "been established to acquire information by special enquiries and "by experimental research, technical trials and commercial valua- "tion regarding new or little known natural or manufactured pro- "ducts of the various Colonies and Dependencies of the British "Empire and of Foreign Countries, and also regarding known "products procurable from new sources, and local products of "manufacture which it is desired to export. This work is carried "out with a view to the creation of new openings in trade, or the "promotion of industrial developments."

2. In an extensive and well equipped series of Research Laboratories, a numerous staff of skilled chemists under the direction of Professor WYNDHAM R. DUNSTAN, M. A., F. R. S., carry out the investigation of the chemical constitution and properties of new dye-stuffs, tanning materials, seeds and food-stuffs, oils, gums and resins, fibres, timbers, medicinal plants and products, with a view to their commercial utilization. Whenever necessary these materials are submitted to special scientific experts, by whom they are made the subject of particular investigation or practical tests. Reports are also obtained from technical or trade experts in regard to the probable commercial or industrial value of any such products, while full information is collected from official or other trustworthy sources regarding the probable extent and cost of available supplies.

Reports on the results of enquiries or experimental investigations are supplied as a rule, without charge, but should special expenses be incurred in connection with any such reports, or with the commercial value of particular materials or manufactured products, which the Council do not consider themselves warranted in meeting, a statement of such outlays will be furnished, for repayment, when the Reports are supplied. Should an investigation or report of exceptional character be asked for by a Government Department, an estimate of the attendant expenses will be submitted, with a view to ascertain whether authority for such expenditure will be given.

To assist Merchants, Planters and others who may wish to avail themselves of the advantages offered as set forth above, the Government have appointed Mr. C. CURTIS, F.L.S., Botanic Gardens, Penang, to act as Agent; to whom all enquiries should be made, and all materials requiring scientific or technical examination, or commercial valuation should be submitted for forwarding to the Imperial Institute.

AGRICULTURAL BULLETIN
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COFFEE AND OTHER PRODUCTS IN ZANZIBAR.

From the report on the trade and commerce of Zanzibar for the year 1901, the following is extracted:—

Coconuts.—Coconuts obtained fairly high prices in 1901, attaining a maximum of 16 dollars per 1,000 in the month of August. Unfortunately, the copra brought into the town was by no means well prepared, and the result was that its price was lower than it should have been. Efforts are, however, being made by the Customs and Agricultural Departments of His Highness the Sultan's Government to make the natives understand that nothing is gained by bringing in copra which is only half dried, seeing that it naturally obtains a much lower price than if properly dried, although the weight of the bags may in the former case be slightly greater.

Coffee.—It really seems as if with proper attention and care in planting, &c. a useful purpose can be served by the local growth of coffee. The writer has himself, in the course of an afternoon visit at a house situated in the grounds of the Universities Mission to Central Africa, up till recently the property of Miss THACKERAY, for many years a member of that Mission, and owned in earlier days by Sir JOHN KIRK, enjoyed a cup of most excellent coffee grown upon that (Mbeweni) estate. Moreover the trees, although lacking through the force of circumstances, careful and thorough cultivation, yet present a healthy appearance, and on the whole there seems to be no reason why, with greater attention, useful results should not be obtained from its cultivation. Mr. LYNE, Head of the Agricultural Department of the Zanzibar Government, furnishes in the annual report of that Department for the year 1901, the following remarks on the subject of this tree:—

"Liberian coffee requires no protection, but light shade appears to suit Arabian coffee. Our plantation of Arabian coffee has been laid out next to a remnant of native forest, and bushes, up against the forest, have been sheltered from the morning sun. These are healthier and larger than those further out in the open. Observing this, and in order to provide a light covering for the trees during the hot season, I planted the whole clearing with grevillea, Ceara rubber trees, mapapayi and cassava; the shade thus produced has proved of great advantage to the trees. We have in the old

nursery a five-year-old Arabian coffee tree which enjoys complete shade, and which is at this moment loaded with berries."

Tea.—In spite of various diseases which have attacked the leaves of the tea plant the Agricultural Department is able to report fair progress with this product. The condition of a large proportion of the trees leaves no doubt that under favourable conditions of soil the plants will thrive during showery weather. It is noteworthy that Arabs and natives take more interest in tea than in any other new product at Dunga. When the leisure loving and improvident character of the Swahili is taken into consideration, as also that of the Arab, and these qualities apply largely to both, it appears to the writer to be half the battle that they should be awake to the advantages to be obtained from the cultivation of this article of trade.

Vanilla.—It would appear from a comparison of the samples of vanilla with those of other countries, which have been sent to the United Kingdom, that Zanzibar can compete with other vanilla-producing countries such as Seychelles.

VIEWS OF A MANAOS RUBBER MERCHANT.

During a recent visit to New York of Mr. N. H. WITT, a leading rubber merchant of Manaos, the rubber centre of the upper Amazon, he was asked by The India Rubber World for his views on the practicability of companies being organised to work on a large scale in the movement of rubber direct from the producing districts to the consuming markets.

"I do not believe that such a thing can be done as yet," said he. "Not that I profess to know more about the subject than any one can know who has spent several years in the rubber trade on the Amazon, and who has felt an interest in everything that has gone on around him pertaining to rubber. My own business is that of buying and selling rubber along the lines of established custom. But I have seen nothing that would lead me to take an interest personally in such an undertaking as you suggest. And I have seen not a few failures.

"There was, for instance, the Comptoir Colonial Francais, which lately went into bankruptcy in Paris, after losing about $2,000,000 in a little more than a year's trading in rubber on the Amazon. These companies, starting without any knowledge of conditions in the rubber countries, send out managers who feel self confident and who are not disposed to learn anything from persons who have been longer on the ground and have gained, perhaps by painful and costly experience, some knowledge of the facts which have to be dealt with.

"The difficulty of the labor problem is an old story which continues to be repeated. In the Amazon valley all the labor must be imported, together with provisions. Whether the trouble is less in this regard in Bolivia, where there are Indians in the rubber forests who can be induced to work, I do not know. But even there,

there are no provisions on the ground, and on the Beni I understand that the proprietors of rubber camps are obliged to import a good quantity of food products. If it is suggested that farm laborers be colonized to cultivate crops for food supplies, I can only ask who is going to do the colonizing, and where are the colonists to come from? The native population will prefer to lead the lives that they have been accustomed to and will be next to impossible to control by foreigners who do not understand their ways. If they are able to earn as much at cultivating beans and farina as they can at cutting rubber, the crops which they grow will not be cheaper than imported food. There are no European peoples who can stand working in the climate of the Amazon valley. Something might be done with coolies, but it is a difficult matter to arrange with the Government of British India for their introduction into South America. There has been talk of importing Chinese, but they would likely all turn traders and desert the rubber camps.

"I am convinced, therefore, that for a good while to come the safest way to deal in rubber is through the establishment of trading houses at the principal centres, as at present, and buying such rubber as may reach the market, from whatever source."

In answer to a question as to whether the existing rubber fields on the Amazon were showing indications of becoming exhausted, Mr. WITT said:

"All the fields which yield rubber other than Caucho still seem to produce the usual output. It is probable, however, that in some districts on the Lower Amazon, the trees have ceased to yield, and the fact that more rubber has been shipped this season from the State of Para than last season may be due to the fact that the rubber workers have gone into new territory. In some cases, the men may have worked harder, as we call it, forced by the low rubber prices ruling now. The increasing total production of the Amazon Valley is due, of course to the general widening of the district gone over in the search for rubber.

"One thing which indicates that the trees in the districts which have longest been worked are becoming less productive, is a fact that the rate of shrinkage in the Islands rubber received at Para gradually becomes greater. I remember that in 1885, a shrinkage of 6 per cent. was expected in Islands rubber and the rate has gradually increased until now a shrinkage of 14 per cent. or even more, is not unusual. And meanwhile there has been no important improvement in means of transportation between the Islands districts and Para. Evidently, there is a smaller percentage of solid rubber in the milk than when the trees were fresher, and with the same amount of smoking as formerly more moisture is retained in the rubber to be lost during shipment. In other words, while the trees apparently yield as much milk as formerly, the real production of rubber per tree is less."

Mr. WITT spoke of the rapid exhaustion of Caucho in all the districts where the Peruvians went in search of it, and it was his impression that the trade of Iquitos, largely based upon Caucho, was not, for this reason, showing any increase. There was a pos-

sibility however, that with the total exhaustion of Caucho on the Upper Amazon—say within the next ten years—the Peruvians might turn their attention to gathering fine rubber, and thus replace in a measure the Caucho trade.

In regard to cable communication between Para and Manaos, Mr. WITT said that great inconvenience to trade resulted at the latter place from the frequent interruptions. With the constant fluctuations in exchange, there was constant risk in business transactions conducted up the river without a knowledge of conditions at Para and in rubber markets elsewhere. With adequate cable facilities, he thought that Manaos would become an even more important centre of the rubber trade. In such an event, all the rubber from the Upper Amazon and its tributaries would naturally find its way to Manaos, even without the aid of such a law as has been put in force for this purpose in the state of Amazonas. It is believed now, however, that the English Company owning the cable is making some improvements, and it is possible that such a course will give a much more efficient service.—*The India Rubber World.*

CASTILLOA RUBBER SEED AND ITS VITALITY.

The period during which the seeds of various economic plants retain their vitality is being investigated at the Royal Botanic Gardens, Peradeniya; but the following figures, supplied to the Ceylon Observer by Mr. CARRUTHERS, may be of interest to any who may wish to send the seeds of Castilloa to a distant place.

Two thousand seeds were sent off from Paris to Peradeniya, packed in leaf mould in four small-tin-boxes, each containing 500 seeds. Upon being opened at Peradeniya on September 26th, six weeks after packing, the seeds were found to be as follows:—

Box	1.	2.	3.	4.	Total.
Fully germinated ...	96	128	67	96	387
Split and beginning to germinate	30	55	20	63	168
Good hard seeds unsplit	14	12	68	75	169
Bad seed-destroyed by bacteria, etc.	350	300	338	260	1,248

This gives a percentage of 37 good seeds (20 per cent. fully germinated, 8 per cent. starting germination, and 9 per cent. good seeds unsplit), and 63 per cent. destroyed by bacteria or otherwise killed. The packing in leaf mould which usually contain numerous bacteria, fungi and insects, is not to be recommended. Probably if sterilised sand had been used, the proportion of good hard seeds would have been very much greater.

This seed is an especially unsuitable one for travelling, as it possesses no protective coat which prevents the inroads of insects or bacteria.

The short time that various economic seeds are credited with retaining their germinating power is, undoubtedly, in many cases, due to the fact that no special precautions are taken to prevent the

attack of insects, fungi and bacteria, which find a congenial home in nearly all seeds. Most of the seeds, which do not grow, are found by their appearance and odour to have lost their vitality by the presence of foreign organisms. When the experiments, with regard to the seeds of Para rubber, tea and other Ceylon economic plants, have been concluded, the matter will be dealt with in one of the Circulars of the Royal Botanic Gardens.

PLANTING OPINION,
1st November, 1902.

"PARA RUBBER" FROM CEYLON.

Ceylon exported last year 7,392 pounds of rubber from cultivated plantations, stocked with the "Para" variety, which was sold in London at good prices, one lot bringing 4*s.* 1½*d.* per pound, against 3*s.* 9½*d.* paid for the "best Para" during the same week. Doctor WILLIS, of the Royal Botanic Gardens in Ceylon, states in his annual report for 1901 that "India rubber may now be regarded as established "as a minor product in the low country............Extension of plant-"ing continues in suitable districts, and probably 3,000 acres are now in rubber."

An English rubber manufacturer writes to The India Rubber World. "We have made several experiments with Ceylon rubber "which have turned out satisfactory. There is little or no difference "between it and the Para obtained from Brazil." What follows from the same letter, is not so clear, in view of the information already given in regard to prices realized for the Ceylon product. "The difference in price makes it a useful adjunct to the rubber "manufacturer's list of economical rubbers, but I do not know "whether this information will, in the near future, render it less "economical; I hope not." *The India Rubber World.*

RUBBER AT THE HACIENDA AGUNA.

In the Journal d'Agriculture Tropicale for September 30th, 1902. Mr. RENE GUERIN gives some further notes from Dr. PREUSS as to the cultivation of Rubber (Castilloa) at Aguna in Guatemala. In this plantation the Castilloas are irregularly scattered among cacao trees, some of them having been wild there when the cacao was planted, others planted later. The Castilloas are found to be not at all suitable as shade for the cacao. The preparation of the rubber on this estate is effected in the following way. The latex is poured into a barrel with a tap at the lower part. It is stirred up with an excess of cold water and allowed to settle, the globules of rubber float and form a creamy layer at the top; at the end of about 18 to 20 hours, the tap is opened and the water mixed with serum runs out. This washing is repeated several times. It may be imagined that on the care taken in these successive washings depends the quality of the rubber and this is certainly the case. If the

washing is continued till the water comes off perfectly pure, the rubber will be of first class quality and keep indefinitely. When it is considered that it has been washed enough warm water is poured on the creamy layer, and coagulation or as the editor of the Journal prefers to call it coalescence is produced. A workman inserts a wooden stirrer and draws out a layer of rubber which he takes off by hand and forms into a lump which is flattened between the cylinders of a small roller. The plates thus obtained are thrown into a large water tank and stop there twenty-four hours, being afterwards dried in the sun. If the washing is complete the rubber remains quite white, but if small quantities of oxidizable matter remain it becomes yellowish, but nevertheless it makes a first class quality of rubber. In order to prepare a good lot at the same time, this preparation is only made once in eight days. The daily collections of latex are mixed together and to avoid their spontaneous coagulation which often happens in 24 hours, the latex is kept in a refrigerator. Here at a very low temperature there is no coagulation nor alteration of any kind, and the latex remains unchanged indefinitely.

M. RODRIGUEZ the proprietor of the Aguna plantation, makes on the spot waterproof materials for his own use. The cloth is painted with a brush with successive layers of fresh latex mixed with sulphate of iron and flowers of sulphur. Then it is exposed to the sun for a sufficiently long time.

It becomes completely black and dry and the mixture adheres very closely to the cloth without interfering with its flexibility, a good deal of washing in plenty of water completes the operation. The sulphur is added to prevent the cloth remaining sticky. M. RODRIGUES imagines that a kind of vulcanization takes place, any way the result is very satisfactory. By mixing a little liquid latex with ordinary paint, he has also found that a very brilliant and durable impervious surface is produced on canvas, wood or iron.

TRANSLATION OF A LETTER BY RAJA BÔT, SELANGOR,

GIVING HIS VIEW ON THE SUBJECT OF

Extending the area of Rice Cultivation.

To His Highness SULTAN SULEIMAN of Selangor, and to the Resident-General W. H. TREACHER, Esq., C. M. G.

I crave permission to approach your Highness and your Honour with this letter, and beg you to weigh fully the contents thereof. If there is any truth in my words please make use of them; if not you may ignore them.

I was first manifested to this world on Friday, the 25th of the month Zil Hayjah, in the year 1263 (A. H.) At eight years of age I had read the *koran* and not long afterwards was judged proficient therein. On the 9th day of Ramathan, 1271 (A. H.) my father, Raja Snay, son of Sultan Muhammad, died, and was buried at Lukut.

Just about that time I began to understand and to take some

notice of the ways and thoughts of men. I remember that the kinds of rice eaten by men in the Malay country were as follows: (1) Javanese rice, very good in quality, with a short stem like the present Rangoon rice, only a little smaller. (2) Siamese rice. (3) Rangoon rice. (4) Rice from Acheen. (5) Rice from Malacca. Those were the five places which produced rice eaten in this country.

In olden times my grandfather, Sultan Muhammad of Selangor, was himself very fond of planting *padi* and also rigorously insisted on all his subjects doing so too. There were tools, and men, moreover, to work. Those who were slow or who did not toil at *padi* planting were punished. On the Selangor river from Telok Penyamun, on the right bank and on the left, as far as Kampong Kedah, in the interior, nothing but *padi* fields could be seen in those days. I well remember that in 1273 (A. H.) the year in which Sultan Muhammad was buried, I bought Selangor rice at the rate of a hundred gantangs for \$5, and *padi* at the rate of a hundred gantangs for \$2.50; ducks, fowls and goats were cheap, because in those days every kind of provision was plentiful and abundant.

Moreover the Langat river from Pendamaran to the place where the canal has been cut, and from the canal to the river Rambay, right and left, Malays worked at their *ladangs*, and there were no *sawahs*. Prices were the same as in Selangor. The Selangor measures differed from those used in Lukut, ten gantangs (Selangor) going to twelve and a-half gantangs (Malacca), for in Lukut the Malacca measure was used, the food for mining coolies coming from Malacca. At that time no foreign rice was consumed in Selangor.

In 1273 (A. H.) Sultan Muhammad died and was succeeded by Sultan Abdul Samad. There were then *sawahs* in Selangor, while on the Langat river men planted *ladangs*. In 1276 (A. H.) rinderpest broke out, and it may be said that all the buffaloes in Selangor died; there remained only ten or twelve, which escaped into the jungle and became wild. These are now in the neighbourhood of Jeram. The result of this was that the Selangor *raiats* ceased working *sawahs*, having lost, as it were, the chief implement of their trade. Sultan Abdul Samad was not powerful enough to insist on the work being continued, for though he himself liked *padi* planting, he could not enforce it upon the *raiats* of the country.

At the age of eleven in 1274 (A. H.) I was taken by the Resident of Malacca, Mr. Mc Pherson, who treated me as his own son, and sent me to the English school in Malacca. The Head Master's name was Jamebreek. For ten months I remained in his house, after which he went to Singapore. I was then given into the charge of Baba Chi Yamchwan, a merchant who had helped my people to open up the river Lukut. For eleven months I dwelt in his house. I could then write Malay, and the letters which came from Lukut to Baba Yamchwan were read by me. Sometimes also I wrote letters from Baba Yamchwan to my people. By these means I became acquainted with prices and other details of business. Soon

afterwards I was required to keep the accounts of dealings between my people and Baba Yamchwan, so that I came to know all about the work. At length, in 1276 (A. H.), I was taken back to Lukut by my people and ceased learning English, and it was my duty to look after the food arrangements of the coolies at the mines, buying the various necessaries myself and selling them to the coolies.

In 1275 (A. H.) for the first time, a duty was imposed upon tin, nothing else being taxed. The duty was 20 per cent. Subsequently the truck system at the mines ceased, and within the next two years the Chinese merchants asked that the 20 per cent. should be abolished, and 10 per cent. taken on tin. A tax was placed on opium, $2 a ball, and on rice, $4 a koyan. These were the three articles taxed.

The price of white Java rice was $58 to $60 a koyan. Siamese rice was $3 less, while th t from Rangoon was $45 a koyan. The last named was not at that time much liked by the Chinese. While Acheen rice was from $37 to $38, and red Acheen rice $27 to $28 a koyan. Malacca rice was sometimes the same price as the Javanese, sometimes as the Siamese variety. The price of tin in Malacca was within $2 or $3, more or less, of $60 a bhara, which is three pikuls. The people of Selangor rarely then went as far as Singapore, trading only with Malacca and Penang merchants.

In 1276 (A. H.) less rice began to come from Java, because the land formerly occupied by *padi*, was now planted by the Dutch with sugar-cane, owing to fact, so said the Javanese who came hither, that sugar was far more profitable than *padi*. A year or two afterwards the supply of rice from Acheen also began to diminish. The reason of this was that the men of Acheen planted black pepper, which they sold at a high price, though the cultivation of *padi* was light work compared with that of pepper and sugar. Moreover in Malacca, where formerly there had been numerous *padi* planters, the Chinese merchants roused themselves, opened up gardens, and grew potatoes and sago. Coolies were required for the work and good wages were offered. Thus it came to pass that many Malay *padi* planters attracted by the high wages, became labourers for the merchants in their gardens. This practically ruined the *padi* cultivation, and from that time Malacca, Java and Acheen lost their reputation for growing rice. Thereafter only a small quantity was produced.

There remained but two countries, Siam and Rangoon, to bear the strain of supplying the large population in this country with rice. Supposing that one or both of these countries were prevented, through plague or some other cause, from exporting rice, how would Your Highness' subjects live? The question of reviving *padi* planting in this land is one which demands the most earnest consideration of Your Highness and the Resident-General, since it is one of vital importance.

In the year 1276 (A. H.) rinderpest broke out. One district in Selangor, *i. e.*, Sungei Lukut, was then putting out a large quantity of tin, and Selangor men came and traded in Lukut, getting $3 and $4 for goods usually sold at $1. The natural result was that the

art of *padi* planting was almost forgotten. My people made large gain at Lukut, and also opened up Sungei Klang and Kuala Lumpur, tin mining being conducted at a profit in 1279 (A. H.). These were the two places in Selangor where tin mining existed in 1281 (A. H.). My grand-parents died at Lukut, leaving my father there.

Ulu Selangor, also, and Bandar Kanching were opened up by my respected father. It followed of course that the *raiats* of Selangor forgot altogether about planting *padi*, preferring to engage in buying and selling.

In 1283 (A. H.) Raja Mahdi quarrelled with Raja Abdullah, and disturbances broke out in Klang, Langat and Lukut. For nine months civil warfare continued; then Raja Muhammad prevailed, and for three years ruled over Klang. In 1286 (A. H.) Raja Ismail, son of Raja Abdullah, returned, and was joined by Tungku Dhia-ud-in, and for about four years there were further disturbances. The inhabitants of the country fled and were scattered in different directions, going to Padang Muar, Malacca, Perak and Penang.

In 1290 (A. H.) a Resident representing the English Government was first established in the State of Selangor. The disturbances ceased forthwith, and, from that time to this peace and quietness have reigned supreme in the land.

All the inhabitants of the country welcomed the rule of the English Government and settled down to a period of the greatest peace and prosperity until 1315 (A. H.) when Sultan Abdulsamad died at the age of 93. The Raja Muda Suleiman was invited to succeed him, and ascended the throne on the 25th Ramathan, 1315 (A. H.) aged 32, taking the name of Sultan Suleiman Aladdin Shah. This is now the fifth year of Your Highness' reign, and during that time the country has exceedingly prospered. But now it is time that Your Highness should give deep and earnest consideration to the question of the rice supply.

As I have mentioned above, three places of export have been entirely lost to us, and there remain only two. It is easy to see that the time may come when they are unable to export the present quantity, and produce sufficient only to be self supporting, unlike Selangor, which in that case would fall into the depths of misfortune and be unable to endure the calamity.

I beg leave to suggest, therefore, that Your Highness should arrange a conference with the Resident-General and the Resident, Selangor, who are representatives of the English Government, which has helped and perfected the conditions of the country, in connection with the Malays of every class who dwell in Selangor. I think that a new law should be passed laying down the method of working and planting *padi*, and enforcing planting by the imposition of rigorous punishments (gaol or fine) on the disobedient and lazy. This might remedy a bad state of affairs, for I crave permission to remind you that Malays are so constituted that unless such a law is rigorously enforced nothing whatever will come of it. You have only to look back to the days of Sultan Muhammad, in 1273 (A.H.) when the law of the ruler was strict, and *sawahs* flourished in Selangor. After his death there was no one who instructed the

raiats, with the result that for the last 47 years they have been extremely remiss regarding *padi* planting. Unless there is strong legislation and a strong hand to enforce it, the cultivation of *padi* will never succeed.

I beg to point out to Your Highness and the Resident-General that Siam and Rangoon resemble the parents, and the countries of the Malays the children. If the child does not in some degree help his parents he is accounted absolutely wicked. It avails nothing though he be ten times as wealthy and great.

Your Highness who has reigned for five years, and Your Honour, who for ten years, as Resident and Resident-General, has caused English justice and prosperity to prevail in Selangor, will be conferring a great benefit upon the people by a consideration of the rice question. I ask then that Your Majesty and the Resident-General will settle the method of rice cultivation and enforce it upon the Malays by a new law, providing penalties and fines for evasion.

I trust that my dissertation will be excused. I have not spoken for the mere sake of giving my history, but because in my time the price of rice has risen from $1.50 to $5.60, more than three times as much. For the last three or four years the price has been steadily rising. This year I have suffered heavily, for last year when I had got my money from the office and paid off my debts for food there still remained $20 or $30; this year only $1 or $2 are left over. Every kind of necessary has risen in price, and the trouble and anxiety resulting therefrom have emboldened me to approach you on this subject.

RAJA BOT.

KLANG, *22nd August, 1902.*

THE CULTIVATION OF ORCHIDS FOR AMATEURS.

Almost everybody that has a garden in this Colony tries to grow a few orchids, but the success attained in the majority of cases, is by no means commensurate to the interest and energy shown. Disappointment is often felt when the plants do grow and come into flower to find that they are small and insignificant. This is only what is to be expected considering that most of those grown are local species of which not one in ten kinds have large showy flowers. To obtain these it is necessary to go farther afield, and having found out the good things, and how to successfully grow them, to increase their number in preference to insignificant species that are mainly of interest to botanist. To keep the majority of Orchids alive for a considerable time is by no means difficult, but to successfully grow and flower them is quite another matter. Few plants are in fact more difficult to kill outright, but to grow them well requires a certain amount of knowledge of their requirements and a good deal of patience and perseverance. Even when this is given, and the most done that can be done, the result is sometimes far from satisfactory

when judged from the standpoint of an European orchid grower who has the all important factors to good cultivation under direct control, such as heat, moisture, and insect pests. Theoretically it does seem that there should be no difficulty in growing orchids here, especially those that occur wild at low elevations in this region, or that come from regions having a similar climate, equally well if not better than is done in glass houses in Europe, but that such is not the case, with a very few exceptions, nobody who has had experience of the work under both conditions will deny. I have in my time seen several botanic gardens, including those of the Mauritius, Peridenia, Buitenzorg, and Calcutta, all of which have a worldwide reputation for their collections of plants, but I can truly say that in none have I seen even the species that are found wild within a mile or two of the gardens equal to plants of the same kind when grown under glass in Europe. I have also seen dozens of private and trade collections in the East and of those I can only say the same. The family is such an immense one, and varying so much in their requirements, that it is impossible to give detailed instructions applicable to all. One has but to take up any of the numerous books on the subject written by experts to realise how wide is the field. I propose at the present to deal with only one genus, that of Calanthe, because they are easily obtainable and there is at the present time, and has been for some weeks past, a considerable show of these in the Pinang Botanic Gardens which have caused much interest. There are two distinct sections of this genus one with evergreen leaves, and the other deciduous, with pseudobulbs; the flowers of the latter appearing when the leaves turn yellow or are entirely absent. All the species succeed with comparative ease in this climate but the system of cultivation to be followed is not the same in both sections. In the evergreen section we have at present in flower 4 species; Calanthe veratrifolia, with white flowers, C. Curculigoides, yellow and orange, C. Cecilia, violet and white; and an apparently unnamed species (C. variabilis) with white sepals and petals and a chrome coloured lip. All these require good soil largely composed of decayed leaves and well rotten cow manure, moderate shade, good drainage and an abundance of water. Under these conditions they may, with the exception of C. curculigoides, be had in flower nearly the whole year through. The deciduous ones require quite different treatment and only flower once each year, but with a good number of plants, and starting them into growth at different times, the flowering season can be prolonged over a period of several months. The best time for potting these is when the young shoots are about an inch long and new roots are being emitted at the base of the pseudo-bulb. They may be grown in either pots or hanging baskets, or even in Coco-Nut-husks, in a mixture of about two parts of leaf-mould to one of broken bricks and old lime rubbish, with the addition of a little well decayed cow or stable manure. Some plants grown in hanging pots in nothing but the outer hard portion of Coco-Nut-husks chopped in small pieces half an inch square have done very well, but with such material manure water must be applied once a week as

soon as the bulbs are about half grown. After potting, and until the roots have got hold of the soil, water sparingly and place the plants under some sort of cover that will prevent the heavy rain from falling on them and lodging in the centre of the young shoots otherwise they are very apt to rot off. As growth progresses increase the amount of water, and as soon as the young shoots begin to fill out and show the form of the parent pseudo-bulb they may be exposed to all the rain and supplied with liquid manure once a week until the bulbs are fully grown when the amount of water should be diminished as there is much moisture in the pseudo-bulbs, and too much water will cause them to rot. At this stage the flower scapes will be pushing up and the leaves turning yellow, and by the time the flowers are past there will also be no leaves left on the plants. At this period they should be placed in some dry place and not receive a drop of water until they commence growing again of their own accord when repotting must be done and the same process gone over again as already described. The commencement of growth and season for repotting is about February or March, and by growing different species plants are in flower from the end of September up to the end of January. Calanthe vestita, and the var. Calanthe vestita oculata, and C. rosea from Burma, which are the best of the species, are the first to come in flower. C. Rubens from Lankawi, and C. Regnierii from Siam, come in later. There are in addition to these many beautiful hybrids the result of crossing C. Rosea with C. Vestita, of which C. Veitchii is the best known here and a beautiful plant. We are this season growing several new ones which I have not yet seen but which are showing for flower. I may here say that the best time to report or transplant almost any orchid is when new roots are just seen beginning to push out, and before these have attached themselves to the object or material in or on which they are growing. If done at this stage and the new substance to which they are attached, or the soil in which they are potted, as the case may be, is suitable, and other conditions favourable, a strong healthy young growth and subsequently abundant flower is the result. Position, that is to say the proper amount of exposure to sunlight, when one can ascertain what that is; is of greater importance than the material used for potting or the kind of wood on which the plants are fastened. Some kinds require all the sun that can be given them and refuse to flower under any other conditions. Renantheras, all the species, also Vanda teres, and Vanda Hookeri are example of these direct sun loving orchids, but in the majority of cases, partial shade is what is requisite.

C. CURTIS.

LOCAL FRUIT PRESERVES.

"Halwa" or "Manisan."

There are a good many fruits growing in the Peninsula which are well worth preserving, but beyond the Pineapple very little is

known or done in this direction by Europeans—at any rate on a large scale. I was much struck by the many varieties served by the Chinese of Malacca in their own houses to European guests, and I very much wished to have some myself. With this object in view, I engaged two Malay women to come in the mornings to teach me to make some of these preserves. They did so willingly always scrupulously clean and well-dressed. The old woman, HAWA, was more talkative than the younger, HALIMA. The latter did her work in the most serious manner possible with a cast iron expression of countenance. She was a widow, and make money by her cooking. She was distinctly good at her trade, very slow and to her neither time or water had any value. One could not preserve during a water famine. They liked to boil their fruit and sugar in a large round brass pot, with two handles which they called a "gensing". Personally, I prefer a white enamelled saucepan. For many of the preserves; it is almost necessary to see the native process in order to thoroughly understand the manipulation of the fruit. Hence it is difficult to write recipes for European understanding. I give, however, two this month as requested.

The Chermela is quite simple and easily made, but the Blimbing is far more complicated. I hope I have made the process plain in my recipe. The Malay women spent endless time and water over the washing and squeezing of this fruit, and it is quite a knack to roll the fruit in salt without breaking the skin. They put green colouring into some of their preserves—Limau kasturi for instance—and one has to keep a sharp look-out that they do not use the pandan reed for this purpose. The smell of Musang-pandan is not an agreeable adjunct to preserves. Chekop manis is, however, quite harmless and can be safely used for this purpose. We made seven different kinds of preservers :—Chermela, Blimbing, Limau Kasturi, Nutmeg, Ginger, Pineapple and Soursop. With the exception of the last named, all were very good, and have been much appreciated by those who have tasted them. Soursop is not worth doing, the fruit is picked unripe and it had such a heavy odour I could not touch it. Perhaps, if crystallized, it could be eaten, but then it would have no distinctive flavour of its own. The domestics did not, however, share my opinion. Neither, do I think the local ginger worth preserving. Chinese ginger is much nicer. I have also seen and tasted five other preserves :—Limau keah, Chiku, Papaya, Pomaloe Peel and Mangosteen. The first too were very indifferent and I am told Limau keah makes better orange brandy, but I have not seen it so used. The Chiku is preserved unripe and is very difficult to do. What I tasted was gritty like Gregory's Powder, and besides very bitter. The Papaya and Pomaloe are crystallized—the Papaya has very little distinctive flavour of its own but is quite eatable, and the Pomaloe Peel is very good, and also makes an excellent substitute for Candied Peel. Mangosteen is very difficult to do, but is much thought of, and is really delicious. The fruit, being out of season, we could not make any of this excellent preserve. In addition to these preserves, there are others which I have not yet tasted or seen. Towkay NEO ONG HEE kindly

supplied me with the following list:—

1.	Buah Mangga		7.	Buah Krendah	
2.	,,	Limau Perut	8.	,,	Binjei
3.	,,	Aren (Kabung)	9.	,,	Duku
4.	,,	Kambing-Kambing	10.	,,	Rambutan
5.	,,	Nangka	11.	,,	Tampang
6.	,,	Rambei	12.	,,	Mata Kuching

Some of these are extremely difficult to make, some would not be at all appreciated by Europeans, and others are quite insipid in flavour; variety, not quality being often preferred by the Chinese and Malays. The former have always some of these preserves in their houses, made either by their wives and daughters, or obtained from Malay women with whom the industry really originates. The best fruit preserves are said to be made in Java and the leading Malays in Malacca always produce these delicacies on their feast days The more the fruit is crystallized, the longer it keeps. The Malays say it will not keep for more than 3 or 4 months in this climate, but then they do not attempt or understand any method for excluding air. Personally, I like the fruits that can be preserved in thick syrup best, and always add a good dash of brandy at the last minute. When much crystallized, they seem to lose their distinctive flavours and are hard to masticate. I do not profess to be an expert in this matter, but perhaps these notes will encourage other ladies to give their experiences. There are several delicious jams and jellies, which can also be made from local fruits, but as they do not come under the Malay category of "Halwa", I have not mentioned them. Perhaps now some one else will be tempted to do so.

L. E. BLAND,
The Residency, Malacca.

RECIPES.

1. *Chermela, or Chermei Preserve.*

Proportions for 1 lb. of fruit.

Rub the fruit in salt with the palm of your hand on a clean board, taking care not to break the skins.

(This is to remove the acid.)

Wash thoroughly in water till all salt is removed.

This will probably take six washings.

Dry the fruit in a cloth, and *weigh.*

Allow 1½ lb. of sugar to 1 lb. of fruit.

Boil the sugar in about a tea-cupful of water to make a fairly thick syrup.

Drop in the fruit, and boil slowly, till fruit becomes a cherry red, and the syrup a proper consistency.

Add a dash of brandy, and set to cool.

NOTE.—It takes about two hours to preserve 1 lb. of this fruit. It should not be boiled too fast. The larger and fresher the fruit preserved the better. Bruised fruit cannot be used. This has quite a flavour of its own, slightly acid.

2. *Blimbing Preserve.* 5 days.

80 Blimbings.
4 catties sugar.
2 young cocoanuts.
¼ lb. sugar-candy.

Rub the fruit gently in salt till quite soft, being very careful not to break the skins.

Drop the fruit in basin of cold water.

Wash and squeeze about 10 times, each time in fresh water (This is to remove acid, and salt.)

Leave the fruit soaking in cold water while the sugar is boiling.

Add ¼ lb. of sugar-candy to boiling sugar.

Now boil in another saucepan, the cocoanut water.

When this is boiling, drop the blimbings into it, and let them boil for a few minutes.

Take the fruit out, and put them in a bowl of cold water, squeeze them, and now drop them into the boiling sugar for a few minutes, when remove and place in an empty bowl.

Pour the boiling sugar into a separate bowl, and when both the fruit and syrup are cold, drop the fruit carefully into the cold syrup and leave till next day.

Boil the sugar separately again 3 or 4 days successively, soaking the fruit in the cold syrup each time for 24 hours, before repeating the process.

NOTE.—The Blimbing is a very acid fruit and very juicy. Hence the long process. When completed, the fruit should be quite transparent, the seeds perfectly visible through the skin. The syrup is delicious, and can be eaten separately like honey. The fruit should not be picked too young.

L. E. BLAND.

FUNTUMIA ELASTICA.

The following notes on the Lagos silk rubber from the Annual Report of the Botanic Gardens of the Gold Coast at Akuri are of interest:—

"Seventy-five more plants were added to the plantation of these trees in the Gardens. Those planted last year have made satisfactory progress despite the repeated attacks of the small larvæ of a moth which infested the plants in hundreds eating their young leaves and branches. These pests have now been exterminated by repeated applications of lime and ashes and sprayings of Bordeaux mixture have ridded the plants of a Fungus Pest "Meliola." One of the trees planted out in the Gardens in 1897, was tapped this year as an experiment to test the amount of rubber it was capable of producing at this age. The tree operated on had grown 26 feet with a trunk of 1 foot 7 inches in circumference at 3 feet from the ground and was about 2 years old when planted. After the moisture from the latex obtained by this experiment had been

evaporated off the dry rubber weighed $\frac{1}{4}$ lb. The result of this experiment is rather important from a financial point of view as it has been pretty generally stated that no return from plantations of these trees could be expected till the 8th or 9th year; whereas it is quite evident they are ready for tapping at the 7th year, and that trees planted at 15 feet apart, *i.e.* 193 to the acre would yield 48 lbs. rubber per acre, value about £6 at the seventh year.

A number of young plants of this rubber tree were planted out in the Botanic Gardens, Singapore, in the early part of this year in a rather clayey slope in the Economic Gardens and in spite of the prolonged drought of this year have made excellent growth. The plants being now five feet high and very strong and leafy. Plants of Payena *Leerii* on the adjoining land planted at the same time are not nearly so well advanced. No insect has attacked them, nor has Meliola so very common in this country done any harm to them. Should this tree continue to grow as well as it has begun to do, we may certainly add it to our stock of cultivatable rubber.

H. N. R.

PARA RUBBER.

As in the near future it will be necessary on some estates, where planting has been done thickly with the intention of thinning by means of tapping to death at an early stage a portion of the crop, the result obtained from four small trees growing in a nursery in connection with the Botanic Gardens, Pinang, may be of interest. In 1885 a seed bed was formed and when the plants were removed five were left standing in a space not exceeding 4 × 4 feet. Under such conditions development has necessarily been slow but one tree, as might naturally be expected, has outstripped the others in the race and now has a girt of 27 inches at five feet from the ground. This tree has not been tapped but the other four were tapped in 1901, two of them severely, but no proper account was kept of the rubber obtained. This year it was decided to tap them again and if possible to kill them, but although barbarously hacked they show no sign of dying and in fact look just as green as the one that has not been tapped at all. The measurements of these trees at five feet from the ground are 22 inches, 20 inches, 18 inches and 16 inches, or an average of 19 inches for each tree. The amount of rubber obtained, prepared in thin sheets and quite dry, is nine ounces, and scrap rubber, that is rubber that coagulated in the cuts or on the tree and collected quite clean, four ounces, or thirteen ounces in all. The largest quantity of sheet rubber obtained at one operation was $\frac{1}{2}$ oz., and the number of times the tapping was done twenty-six. The cost of collecting the rubber from such small trees will not I am afraid leave any great margin of profit. In the present case the work was done by a small Tamil boy who was living on the spot, and I cannot say exactly how long

he took over it, but with the tapping implement he used, which is one Mr. MIEKLE obtained from Ceylon, the work can be very expeditously done.

C. CURTIS.

SOIL FOR POT PLANTS.

The results of a recent experiment with different mixtures of soils on Balsams grown in pots, and the effect of manuring, although not having any pretence to scientific value, may nevertheless be of some interest, especially as in the absence of an ample supply of leaf-mould the difficulty of obtaining a suitable mixture is one that troubles the local amateur gardeners considerably. Red soil, that is, the ordinary granitic soil of the Island of Pinang, is the most easily obtainable and therefore the kind that is most generally used, but without liberal manuring it is of very little use. Coconut fibre refuse is also deficient in the constituents of plant food but it may be advantageously used in small quantities to lighten the soil. In the experiments above referred to and detailed below, one hundred and eight plants of Balsams, of exactly the same age and size, were divided into six lots and planted in thirty-six pots, three in each pot, and placed side by side under exactly similar conditions. Three of each lot were watered occasionally with liquid Poudrette manure, and the others received no manure of any kind. The measurements were made when the plants had arrived at maturity.

SOIL MIXTURE.	RESULT.
1.—Soil from Municipal dumping ground consisting of sweepings of country roads containing a large proportion of decayed leaves.	Unmanured plants 15-17 in. high. Manured plants 18-20 in. high, good.
2.—Half red granitic soil and half soil from Municipal dumping ground, same kind as No. 1.	Unmanured plants 12-14 in. high. Manured plants 18-20 in. good.
3.—Half Coco-nut-fibre refuse and half road sweepings as in No. 1 & 2.	Unmanured plants 14 in. high, poor. Manured plants 18-19 in. high.
4.—All Coco-nut fibre refuse.	Unmanured plants 6-10 in. high, thin as needles. Manured plants 12-15 inches.
5.—All red soil.	Unmanured plants 6-10 inches high, thin and wiry. Manured plants 12-15 inches middling.
6.—Half red soil and half Coconut fibre refuse.	Unmanured plants 9-10 inches high, weak and useless. Manured plants 12-15 inches but not good plants.

No. 1 alone, or mixed with red soil (No. 2) are both good composts suitable for a great number of pot plants, but as in the case of many other plants the advantage of adding manure can be seen by the difference in the growth of the manured and unmanured Balsams. Red soil alone is wanting in the requisites of plant food and is too binding, it should be mixed with a liberal quantity of old cattle manure of leaf-mould or both.

Coco-nut-fibre refuse by itself is very poor but saturated with manure it will grow many things, and as a means of keeping soil open and free it may often be used in small quantities as an admixture.

C. CURTIS.

AGRICULTURAL SHOWS.

The Editor has received the following Correspondence dealing with Mr. CURTIS' proposals for making our Agricultural Shows more systematic and useful.* The suggestions and emendations seem to be mostly very suitable. The Resident of Perak points out that it would be unfair to allow Botanic Gardens to compete with individuals. This I think goes without saying, nor do I think it has ever been done in the Straits at least so far as Singapore and Penang is concerned. But all Government gardens should exhibit new or well grown plants, samples of produce etc. not for competition. This brings new cultivations to the sight of the visitors to the Show, Native and European. The same applies to persons trading in plants, not *boná fide* private cultivators.

The British Resident, Selangor, suggests that certificates should be given by the District Officer or some other trustworthy person as to the genuineness of the exhibits, that they are *boná fide* the produce of the exhibitor's land. This would entail a very great deal of extra work on the part of all, and I fear in many cases would be impracticable, and certainly so in the case of mineral exhibits which he suggests. Undoubtedly, I have seen specimens of produce which were certainly not grown in the district, at some shows, but in many cases, the fact is obvious to any judge.

Manufactures and Art Industries. It would not be easy if possible to have the process of actual manufacture shown in all cases. The definition of what should be classed as a manufacture and what as a work of art should be left to the local Committee. Pottery, *e.g.* put under Works of Art by the Resident of Perak could come under either heading.

Minerals are suggested as suitable for exhibition by the Resident of Selangor. Personally I do not agree. In the first place it would be very difficult to decide where the specimens came from. Again I do not see any advantage in exhibiting mineral specimens for prizes, as beside the fortune of finding a lode or deposit the exhibitor has not done anything in the way of work, to make competition justifiable, nor probably would exhibits of mineral be of much

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* No. 12 v. 505.

value to the general public in Singapore or Penang when the shows were held there.—*Ed.*

RESIDENT, PERAK, TO RESIDENT GENERAL.

BRITISH RESIDENCY,
Perak, Taiping, 8th October, 1902.

R.-G.O. 6635/02.

Sir,—I have the honour to acknowledge receipt of your letter, 5386/02, with enclosures, of the 15th September, on the subject of holding properly organised Agricultural Shows, annually, in the Federated Malay States and the Colony.

2. In reply to the enquiries contained in the second paragraph of your letter, I think that Kuala Lumpur will be the best place in the States for the first Show, in 1903; and I would recommend the three following gentlemen as representatives of Perak on the proposed standing Committee:

Mr. A. B. STEPHENS, Forest Officer and Acting Superintendent of Government Plantations;
Mr. H. C. BARNARD, Resident Engineer for Railways;
Mr. A. L. INGALL, District Magistrate, Batang Padang (Acting Senior Magistrate).

3. The great object to be aimed at, in connection with these shows, is that they should be of as practical a character as possible; and in my opinion, unless the exhibits themselves, and the manner in which they are shown, are such as to afford a reasonable probability that they will be of practical benefit to the persons locally interested (especially Asiatics), there is no justification for holding the shows at all.

4. Dealing seriatim, with the exhibits classified in paragraph 7 of Mr. CURTIS' memorandum, I would offer the following suggestions:—

Agriculture.—This is by far the most important of all the classes, and we want to do three things: (1) improve the local cattle, sheep, pigs, horses (ponies) and poultry; (2) improve the grain sown (especially rice) and the method of cultivation; (3) introduce simple agricultural machinery. In England, private enterprise can be relied on for effective representation at these shows in every department, but here the initiative must largely be taken by Government. From Perak we can send fairly good cattle, selected from the Government herd; but I should like to see a Federal Model Farm in the Federated Malay States, on which not merely live stock of every description would be raised, but rice and other agricultural products would be cultivated, according to the methods and with the machinery best suited to the local surroundings. In the meanwhile, and at this first show, I would suggest that the Government of the Federated Malay States can best demonstrate its interest in this very important question, and afford the best object lesson to native visitors in the following manner: by purchasing and exhibiting good

specimens of live stock of every description; by procuring selected specimens of various seeds, and exhibiting them *under cultivation* in the immediate neighbourhood of the show; by similarly procuring and exhibiting in *actual operation* cheap ploughs, harrows and other specimens of simple but effective agricultural machinery. Such an exhibit would be a liberal education to all native cultivators in this part of the world.

Horticulture.—What I have written above applies to a great extent, to this class also; and I would recommend that the native sections of this class should be organised on much the same lines as those of the "cottage garden" shows in England. It would be both unfair and disheartening to the native competitor to allow the produce of the Botanical Gardens of Singapore and Penang, or the Government Gardens of Perak and Selangor, to compete with the results of his individual, and necessarily restricted, efforts.

Manufactures.—This will include, I presume, only articles of a strictly utilitarian nature; although most of these can, and should, possess some artistic value. Wherever possible, the process of actual manufacture, as well as the results, should be shown.

Works of Art.—I would suggest that "Art Industries" should be substituted as the title for this class. It is not merely the result, but the process, that we want to see exhibited; whether in weaving, pottery making, damascening, carving, or any other artistic industry.

5. I agree, generally, with the rest of Mr. CURTIS' memorandum and think that three days should be the period for the show to remain open.

I have, etc.

J. P. RODGER.

RESIDENT, SELANGOR, TO RESIDENT-GENERAL.

BRITISH RESIDENCY,
Selangor, 28th September, 1902.

No. 5073/02.

Sir,—In reply to your letter 5386/1902 of 15th instant, with enclosures, on the subject of holding Agricultural Shows annually in the Federated Malay States and the Colony, in which you invite my comments, recommendations and suggestions, I have the honour to say that personally I am opposed to holding such shows under present conditions in the Federated Malay States.

2. They involve a considerable expenditure of Government money, and a still larger expenditure of time and energy on the part of Government officers which can ill be spared from other duties, while the results so far as "educational value" is concerned appear to be "nil," and the "healthy competition" is conspicuous by its absence—the only persons who benefit, so far as I have been able to observe, being certain enterprising persons who ransack

the markets for "exhibits" and make a handsome profit out of the prizes awarded to them without having to go to the trouble of growing or manufacturing anything.

3. If, however, it is decided by Government that a show is to be held next year, I will of course do my best to promote its success, but I would point out that the month of July will not meet Mr. CURTIS' requirements—which are (*vide* paragraph 8 of his memorandum) that the date "should be fixed at least a year in advance and prize lists issued at least nine months before the date of the show."

4. The three members of the standing Committee to represent Selangor should in my opinion be the Collector of Land Revenue, Kuala Lumpur, the Superintendent, Experimental Gardens, and the Chairman, United Planters' Association; but I have not as yet consulted these gentlemen as to their willingness to serve.

5. If it is desired, as Mr. CURTIS suggests, to induce healthy competition, it should I think be made a rule that prizes will only be given to the *growers* of the agricultural and horticultural exhibits, who should be required to produce certificates either from the District Officer or from some trustworthy person that the articles shown are *bona fide* the produce of the land of the exhibitor.

6. I notice that minerals and live stock are not included in paragraph 7 of Mr. CURTIS' memorandum.

7. With regard to Mr. CURTIS' proposal to extend the period during which the shows are open to four days instead of two, and to provide for the reading of papers and the discussion of subjects affecting agriculture, I think any attempt in the direction of the last named objects would result in failure, but it is not unlikely that it will be advisable to extend the show time to three days instead of two.

I have, etc.,

A. R. VENNING.

RESIDENT, NEGRI SEMBILAN, TO RESIDENT-GENERAL.

BRITISH RESIDENT'S OFFICE,

Negri Sembilan, Seramban, 9th October, 1902.

No. N.S. 3615/02.

SIR,—I have the honour to inform you in reply to your letter No. C.S. 5386/02 of the 15th ultimo that the following gentlemen in the Negri Sembilan might, I think, be appointed to the proposed standing committee of the Annual Agri-Horticultural Show:—

(1) The Resident;
(2) The Chairman, Negri Sembilan Planters' Association;
(3) Another member appointed by the Negri Sembilan Planters' Association;
(4) The Collector of Land Revenue, Seremban.

2. I think that the members of the standing Committee should be Europeans and the number should be limited, as far as possible,

all nationalities being represented on the local Committee of each State.

3. I think Kuala Lumpur would be the best place for the first show.

I have, etc.,
D. H. WISE.

RESIDENT, PAHANG, TO RESIDENT-GENERAL.

BRITISH RESIDENCY,
No. 2078/02. *Pahang, 25th October, 1902.*

SUBJECT:
AGRICULTURAL SHOWS.

Reply to 5386/02.

SIR,—In reply to paragraph 2 of your printed letter, No. 5386, dated 15th September, on the subject of Agricultural Shows, I have the honour to inform you that this is a matter upon which I know very little. I can only say that of course it is out of the question to hold any such show in Pahang, and I fear the prohibitive cost of transport will prevent Pahang taking any large share in shows held elsewhere.

2. Such being the case, it would appear to me to be preferable to appoint each District Officer as an agent for the purpose set out in Mr. CURTIS' paragraph 2, rather than appoint a Committee of three who could seldom or never meet and would never have a show to organise.

I would suggest Kuala Lumpur as a suitable centre for the first show.

I have, etc.,
F. DUBERLY.

5386/02.

SUMMARY OF III-VI.

PLACE.

Kuala Lumpur the best place for the first show.

STANDING COMMITTEE.

PERAK.

Mr. A. B. Stephens;
,, H. C. Barnard;
,, A. L. Ingall.

SELANGOR.

The Collector of Land Revenue, Kuala Lumpur;
The Superintendent, Experimental Plantations;
The Chairman, United Planters' Association.

NEGRI SEMBILAN.

The Resident;
The Chairman, Negri Sembilan Planters' Association;
Another member appointed by the Negri Sembilan Planters' Association;
The Collector of Land Revenue, Seremban.

PAHANG.

Each District Officer.

GENERAL REMARKS.

BRITISH RESIDENT, PERAK.—Thinks that unless the exhibits are likely to be of practical benefit to the people locally interested, there is no justification for having the shows at all.

Agriculture.—Three objects:

(1) Improve the local cattle, sheep, pigs, horses, poultry;
(2) „ „ grain sown (especially rice) and the method of cultivation;
(3) Introduce simple agricultural machinery.

The initiative must largely be taken by Government. From Perak fairly good cattle selected from the Government herd can be sent.

Government should purchase and exhibit good specimens of live stock of every description; procure selected specimens of various seeds,and exhibit them *under cultivation* in the immediate neighbourhood of the show; also cheap ploughs, harrows and other specimens of simple but useful agricultural machinery *in actual operation.* Such an exhibit would be a liberal education to all native cultivators.

Horticulture.—The native sections should be organised on much the same lines as those of the "cottage garden" shows in England. Unfair o allow the produce of the Botanical Gardens, Singapore and Penang, or the Government Gardens of Perak and Selangor, to compete with the results of the native competitor's individual, and necessarily restricted, efforts.

Manufactures.—Should only include articles of a strictly utilitarian nature: wherever possible, the process of actual manufacture, as well as the results, should be shown.

Works of Art.—Should read "Art Industries"—not merely the result, but the process is wanted, whether in weaving, pottery making, carving or any other artistic industry.

Thinks the show should be open for 3 days.

BRITISH RESIDENT, SELANGOR.—Is personally opposed to holding such shows under present conditions in the Federated Malay States. Considerable expense to Government, and still larger expenditure of time and energy on the part of Government officials, who can ill be spared from other duties. Results so far as "educa tional value" is concerned appear to be nil, and the "healthy competition" is conspicuous by its absence.

Points out that July, 1903, will not meet Mr. CURTIS' require-

ments, since (paragraph 8 of his memorandum) the date "should be fixed at least a year in advance, and prize lists issued at least nine months before the date of the show."

It should be made a rule that prizes will only be given to the growers of the agricultural and horticultural exhibits, who should be required to produce certificates either from the District Officer or some trustworthy person that the articles shown are *bonâ fide* the produce of the exhibitor's land.

Notices that minerals are not included among the exhibits.

The reading of papers and discussion of subjects affecting agriculture likely to be a failure, but advisable to keep the show open for 3 days.

BRITISH RESIDENT, NEGRI SEMBILAN.—The standing Committee should consist of Europeans and be limited in number, all nationalities being represented on the local Committee of each State.

BRITISH RESIDENT, PAHANG.—Out of the question to hold a show in Pahang, while prohibitive cost of transport will prevent Pahang from taking any large share in shows held elsewhere. Preferable to appoint each District Officer as an agent, rather than a Committee of three, who could seldom or never meet and would never have a show to organise.

C. W. H. COCHRANE,

Kuala Lumpur, 31st October, 1902.

FEDERATED MALAY STATES.

MEETING OF CHETTIES AT CARCOSA, KUALA LUMPUR, 12TH NOVEMBER, 1902.

Address by the Resident-General.

I have asked you to meet the Resident, Selangor, Mr. HILL, Protector of Indian Labour, and myself because Mr. HILL is about to proceed to India, on behalf of the Government, to endeavour to make better arrangements with the British India Steam Navigation Company for facilitating the inflow of Indian labourers, agriculturists and artisans, for inaugurating direct steam communication between Southern India and Selangor, and for providing for through booking by rail and steamer to the Federated Malay States.

I want to ascertain from you what your views are regarding the part you and your principals should play in the development of this country, in which you make your harvest of gain.

We welcome you here, and we recognise your trading ability and your use as Bankers to the native communities. At the same time, as reasonable business men, you must admit that you hardly in any way directly contribute towards the revenue of the country or the cost of administration and development. You do not make use of exciseable articles—drink spirits, smoke opium nor pay taxes in return for the good Government under which you live. You have here all the advantages of India, without its taxation. You must bear in mind especially that hitherto you have not been called upon to pay any income tax, as you do in India,

I am given to understand that in your own countries you use your wealth in making advances to agriculturists and others, and it is a business which, under proper safeguards, we should like to see you take up here and so aid in the development of the country and by the introduction of agriculturists, assist in rendering the fertile lands, and abundant waters of these States revenue producing.

The Government would be prepared to consider in a liberal spirit applications by *boná fide* applicants of Indian origin for land for agricultural purposes, provided that the applicants engage to cultivate one or two crops annually.

I am told, moveover, that it is the custom of your people, on the annual balancing of your accounts, to put aside a proportion of the profits for charitable and educational purposes, for temples, rest-houses, and for new ventures, but I am not aware that in this country you have devoted any portion of your large profits to these very proper and useful purposes.

The amounts that you set aside at present for charitable purposes do not, so far as I am aware, take the shape of an organised system benefiting this country, but your own country, India, only, and I expect from you that in the future you will consider the wants of the country in which you reap your wealth. I now ask you to consider these points and in due course lay them before your principals with a view of inducing them to assist in developing the resources of these States, by, for instance, taking up land, or inducing others to do so for permanent settlement and cultivation, by the introduction of communities of one caste who will live as nearly as possible in the same way as they do in their own country, or in other ways that may occur to you and to them.

As you are well aware this country does not suffer from droughts, as the southern parts of India do and therefore money invested in rice and grain-growing would be a safer investment here than there. The facilities of transport are here immeasurably greater—better roads and more railways in proportion to the area of the country—and there exist good markets locally and in the Straits Settlements.

Some of you will know about the waste lands near Madura that were affected by the bringing in of water by the Periyar Water Scheme to work land that some of you must have known for many years valueless and unproductive from want of water—now paying the Government a water cess of from Rs. 2 to Rs. 8 per acre per annum, and proving highly remunerative to the owner and cultivators. Here the land is equally good and if ploughed as frequently as is the custom of your people would probably yield more crops than land in India, the rainfall and climatic conditions generally being more favourable.

I can also tell you that the Government is expending one and a half million dollars on Irrigation Works in the padi-growing district of Krian, Perak.

Mr. HILL is going to India, and the words I have said to you will be written down in Tamil and, if you desire it, "Telegu," and copies will be given you to circulate amongst your friends.

If you will have a list made out of your firms here and your prin-

cipals' firms, with the names of the towns where they reside, Mr. HILL, when in their districts, will send for your principals and explain to them the agricultural and commercial potentialities of this country and give them any information they may desire—and we hope that you will amongst yourselves look for an energetic leader and form some Scheme by which both you and the Government will derive permanent benefit and profit.

You will bear in mind what I have said as to your present practical exemption from all taxation.

CARCOSA,
Kuala Lumpur, 12th November, 1902.

CORRESPONDENCE.

COAGULATION OF RUBBER.

LANADRON ESTATE,
Muar, 1st December, 1902.

To the Editor,

AGRICULTURAL BULLETIN.

Dear Sir,

Following up my letter to you of September 24th last, the articles in question by Dr. WEBER are contained in three issues of the "India Rubber and Gutta-Percha Trades' Journal", dated Sept. 15th, 29th and Oct. 13th respectively and I am sure are well worth the careful attention of any one interested in rubber planting. The main points particularly relating to co-agulation are as follows:—

I. That the so-called co-agulation of rubber by acids or alkalies is erroneous in that it is only the albumen which is co-agulated by these substances and not the India-rubber itself.

II. That the albumen contained in latex is very harmful in many respects, and that it ought to be entirely eliminated from the milk before attempting to co-agulate the rubber.

III. The method recommended for co-agulation is, briefly, as follows:—

First mix the latex with water, at least five times the volume of the latex. In cases where the latex is thick, actually boiling water may be used to advantage. In this state, it can be easily strained to remove all impurities.

After this add formaldehyde in the proportion of 8 oz. to a petroleum barrel, stir it well and let it stand for 24 hours, when the rubber will collect on the top and can be lifted out in one mass.

In order to remove any traces of albumen that may be suspended, the rubber should be cut into strips and subjected to a thorough washing upon an ordinary rubber washing machine.

I hope that my letters may create some interest in the question and result in some experiments being carried out and duly recorded for publication in the "Bulletin."

After all the value of rubber is determined by its analytical contents and it would be much more instructing were we to receive the analysis of samples sent home, instead of a valuation, which may or may not be correct.

We know (or at least should do so) exactly what the requirements of the manufacturers are and should leave no stone unturned to supply them with a product such as they require. That this can be done, there is little doubt and I suggest it is now time to investigate the matter thoroughly otherwise it may be the case of "give a dog a bad name etc." The matter rests entirely with the planters themselves and will be entirely due to their efforts as to whether cultivated rubber from the Straits (or Malay Peninsula) finds a ready sale on the European markets at a higher price than even "Fine Para."

I remain, Dear Sir,

Yours faithfully,

FRANCIS PEARS.

NOTE.—It is to be hoped that the large body of Planters in the Peninsula whose interests lie in the direction indicated above, will avail themselves of the pages of this Bulletin to record the result of their experiments and to give expression to their opinions on this vital question.—*Editor*.

PROPAGATION OF STEPHANOTIS.

Dear Sir,

Would it be too much to ask you for hints on the propagation of Stephanotis by cuttings or otherwise? I have tried the Marcottage system described in the October issue of the Agricultural Bulletin but so far without success.

Yours truly,

B. BERRINGTON.

We generally find that with Stephanotis simple cuttings are preferable to Marcotting. The cuttings should be taken from old wood, at least of one year's growth. The cuttings of about two joints, start growth, in fairly good soil with plenty of sand, usually readily enough. The soil must of course be kept damp but not saturated, and the cuttings should be put round the sides of the pot so as to press against it. Of course as in all cuttings, care must be taken to cut just below a joint, as it is only from joints that roots are produced.—*Editor*.

TANNING CROCODILE SKINS.

Dear Sir,

I am writing to you as Editor of the Agricultural Bulletin in the hope that you may also be able to help me in the matter of

tanning crocodile skins. I am afraid that there is rather a wide breach between these two things and I would not have thought of addressing you on the subject, but that some one told me that you would be the man to ask.

Can you please, give me any advice as to the treatment of the skin so as to make it soft and pliant and suitable for use in making bags etc.

I should be so very obliged if you could help me.

Yours faithfully,

S. H. LANGSTON.

I regret I have had personally no experience in the preparation of crocodile skins for bags, nor could I get any information on the subject from the Singapore Museum. I have, however, noted from various works in the Library that in curing alligator's skins, only the belly and flanks are used, and these steeped in lime and afterwards tanned. MONTAGUE BROWN in his Taxidermy gives the following recipes for preserving skins generally:—

PRESERVATIVE SOAP:

Whiting or chalk ...	... 1½ lbs.
White Windsor or common Curd soap	½ lb.
Chloride of lime ...	... ½ oz.
Tincture of musk ...	... ½ oz.

and as a PRESERVATIVE POWDER—

Burnt alum	... 4 parts.
Saltpetre	... 1 part.

to be rubbed into the skin. I think this latter will be the most suitable preparation.

Perhaps some other reader will give his experiences in this matter.—*Editor.*

PARA RUBBER STUMPS.

Klang, 3rd December, 1902.

The Editor,

AGRICUTURAL BULLETIN.

Dear Sir,—Referring to your article on Para Rubber Stumps in the last number (13) of the Agricultural Bulletin, page 552, you might perhaps like to hear of my experience in that connection which fully confirms what you say.

I have transplanted Rubber trees, three and more years old, all of more than 2 inch. diameter, stumped about 6 feet from ground. A slanting clean cut seems the best. Closing the same with clay or cow dung was my habit. It took almost four weeks before any shoots were to be noticed, but after that time, generally up to five appeared at once. One of these has always proved by far the strongest and grew in some cases at the rate of almost one inch per day. The most rapid growth is from 8 to 10 days after the shoot had fully developed. After three months these old stumps

were equal to somewhat short-stemmed three year old trees, which, I think, should be a matter worth the consideration of capitalists who wish to reduce the time they have to wait until tapping is possible, by a number of years. The growth of the shoots was absolutely apalling.

Yours faithfully,

W. R. ROWLAND.

NOTICES.

(1).

The Para Rubber trees in the Botanic Gardens, Singapore, are now commencing to produce the seed crop. Planters who have put their names down in previous years for seed, and no longer want any, are requested to write to the Director to inform him.

(2).

Correspondents are requested to stamp their letters fully, as a large number of letters have been received from various parts of the world either not stamped at all, or insufficiently stamped.

(3).

All applications for Bulletin should be made to the Editor who will also receive subscriptions.

SINGAPORE MARKET REPORT.

October, 1902.

Articles.	Quantity sold.	Highest price.	Lowest price.
	Tons.	$	$
Coffee—Palembang	...	30.00	29.00
Bali	70	22.75	22.00
Liberian	168	21.00	20.00
Copra	3,323	9.50	8.50
Gambier	3,350	15.62½	14.75
Cube Gambier, Nos. 1 & 2	210	23.75	20.00
Gutta Percha, 1st quality	...	450.00	300.00
Medium	...	300.00	150.00
Lower	...	150.00	50.00
Borneo Rubber Nos. 1, 2 & 3	...	142.00	70.00
Gutta Jelutong	...	7.00	6.25
Nutmegs, No. 110's	...	48.00	46.00
No. 80's	...	87.00	85.00
Mace, Banda	...	105.00	86.00
Amboyna	...	105.00	90.00
Pepper, Black	275	36.00	33.50
White	415	55.50	53.00
Pearl Sago, Small	60	5.60	4.90
Medium	...	6.00	5.60
Large	...	6.50	6.25
Sago Flour, No. 1	2,540	4.07½	3.70
No. 2	450	1.90	1.65
Flake Tapioca, Small	907	7.00	4.30
Medium	30	5.50	5.00
Pearl Tapioca, Small	745	6.50	4.35
Medium	922	6.87½	4.30
Bullet	...	5.50	5.00
Tin	2,630	83.50	77.75

(*A*)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 31st October, 1902.

Wired at 3.15 p.m. on 1st Nov., 1902.

			Tons Steamer.
To England:—			
Tin	from Singapore & Penang	to England - and U. K. optional any ports	1,600
Gambier	from Singapore	to London -	20
,,	,, ,,	to Liverpool-	250
,,	,, ,,	to U. K. & / or Continent -	700
,,	,, ,,	,, Glasgow -	...
Cube Gambier	,, ,,	,, England -	60
White Pepper	,, ,,	,, ,, -	120
Black ,,	,, ,,	,, ,, -	...
White ,,	,, Penang	,, ,, -	90
Black ,,	,, ,,	,, ,, -	...
Pearl Sago	,, Singapore	,, ,, -	120
Sago Flour	,, ,,	,, London -	425
,,	,, ,,	,, Liverpool -	975
,,	,, ,,	,, Glasgow -	50
Tapioca, Flake	,, S'gapore & P'nang	to England -	500
,, Pearl & Bullets	,, ,,	,, ,, ,, -	500
,, Flour	,, Penang	,, ,, -	750
Gutta Percha	,, Singapore	,, ,, -	70
Buff. hides	,, ,,	,, ,, -	120
Pineapples	,, ,,	,, ,,	cases 1,750
Copra	,, ,,	,, Liverpool	100
To America:—			
Tin	,, Singapore & Penang	-	350
Gambier	,, ,,	-	250
Cube Gambier	,, ,,	-	40
Black Pepper	,, ,,	-	100
,,	,, Penang	-	180
White Pepper	,, Singapore	-	90
,,	,, Penang	-	...
Nutmegs	,, Singapore & Penang	-	23
Tapioca, Flake & Pearl	,, ,, ,,	-	590
Pineapples	,, ,, ,,		cases 750
To the Continent:—			
Gambier	from Singapore	to South Continental Ports	50
,,	,, ,,	,, North ,, -	20
Black Pepper	,, ,,	,, South ,, -	...
,,	,, ,,	,, North ,, -	10
,,	,, Penang	,, South ,, -	50
,,	,, ,,	,, North ,, -	...
White Pepper	,, Singapore	,, South ,, -	60
,,	,, ,,	,, North ,, -	140

		Tons Steamer.
White pepper	from Penang to South Continental Ports	30
,,	,, ,, ,, North ,, -	80
Copra	,, Singapore & Penang to Marseilles -	440
,,	,, ,, ,, ,, Odessa -	...
,,	,, ,, ,, ,, South Continental Ports - (other than Marseilles and Odessa.)	900
,,	,, ,, ,, to North Continental Ports	860
Tin	,, ,, ,, ,, Continent -	320
Tapioca Flake	from Singapore & Penang to Continent -	120
Tapioca Pearl	,, ,, ,, ,, ,, -	230
Cube Gambier	,, Singapore ,, ,, -	40
Pineapples	,, ,, ,, ,, cases	500

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,950 tons Gambier
160 ,, Black Pepper (*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

(B)

Exports from Singapore and Penang to Europe and America.

For fortnight ending 15th November, 1902.

Wired at 2 p. m. on 17th November, 1902.

To England:		Tons Steamer.
Tin	from Singapore & Penang to England - (and U. K. optional any ports)	1,200
Gambier	from Singapore to London -	20
,,	,, ,, to Liverpool-	...
,,	,, ,, to U. K. &/or Continent -	490
,,	,, ,, to Glasgow -	20
Cube Gambier	,, ,, to England -	40
White Pepper	,, to ,, -	70
Black Pepper	,, ,, to ,, -	...
White Pepper	,, Penang to ,, -	20
Black Pepper	,, ,, to ,, -	20
Pearl Sago	,, Singapore to ,, -	40
Sago Flour	,, ,, to London -	290
,,	,, ,, to Liverpool -	...
,,	,, ,, to Glasgow -	50
Tapioca, Flake	,, S'pore & P'nang to England -	350
,, Pearl & Bullets	,, ,, to ,, -	170
,, Flour	from Penang to ,, -	700

			Tons Steamer.
Gutta Percha	from Singapore to England	- -	50
Buff hides	„ „ to „	- -	10
Pineapples	„ „ to „	- cases	...
To America:			
Tin	„ Singapore and Penang	- -	950
Gambier	„ Singapore	- -	625
Cube Gambier	„ „	- -	10
Black Pepper	„ „	- -	10
„	„ Penang	- -	380
White Pepper	„ Singapore	- -	50
„	„ Penang	- -	...
Nutmegs	„ Singapore and Penang	- -	36
Tapioca, Flake and Pearl	„ „ „	- -	380
Pineapples	„ „	- cases	500
To the Continent:			
Gambier	from Singapore to South Continental Ports		20
„	„ „ „ North „		180
Black Pepper	„ „ „ South „		60
„	„ „ „ North „		10
„	„ Penang „ South „		...
„	„ „ „ North „		...
White Pepper	„ Singapore „ South „		10
„	„ „ „ North „		20
„	„ Penang „ South „		...
„	„ „ „ North „		20
Copra	„ Singapore & Penang to Marseilles		360
„	„ „ „ Odessa		2,200
„	„ „ „ South Continental Ports other than Marseilles and Odessa.		400
„	„ „ „ North Continental Ports		640
Tin	„ „ „ Continent		110
Tapioca Flake	„ „ „ „		280
Tapioca Pearl	„ „ „ „		170
Cube Gambier	„ Singapore to Continent		...
Pineapples	„ „ „ „	cases	500

N. B.—By "South Continental Ports" are to be understood all inside and by "North Continental Ports" all outside Gibraltar.

1,000 tons Gambier
280 „ Black Pepper (*in Singapore*) } contracted for during fortnight ending as above.

Telegraphed to A. A. NIBLETT, Ingram House, 165, Fenchurch Street, London, E. C.

Singapore.

Abstract of Meteorological Readings for the month of November, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.				Prevailing Direction of Winds.	Total Rainfall,	Greatest Rainfall during 24 hours.
				Maximum.	Minimum,	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
	Ins.	°F.	°F.	°F.	°F.	°F,	°F.	Ins.	°F	%		Ins.	Ins.
Kandang Kerbau Hospital Observatory	29·893	139·3	78·9	87·4	70·8	16·6	76·8	·862	75·4	80	S. E. & N.W.	4·52	2·54

K. K. Hospital Observatory,
Singapore, 5th December, 1902

A. B. LEICESTER,
Meteorological Observer.

J. LEASK,
Acting Principal Civil Medical Officer, S. S

Penang.

Abstract of Meteorological Readings for November, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins.	°F	%		ins.	ins.
Criminal Prison Observatory	29·899	141·8	80·2	88·5	74·1	14·4	75·2	·783	70·5	71	N.W.	9·90	1·62

Colonial Surgeon's Office,

Penang, December, 1902.

M. E. SCRIVEN,
Asst. Surgeon.

G. D. FREER,
Acting Colonial Surgeon, Penang

Malacca.

Abstract of Meteorological Readings for November, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
	ins.	°F	°F	°F	°F	°F	°F	ins	°F	%		ins.	ins.
General Hospital.	29·827	150·7	82·5	89·3	76·3	19·0	81·1	1·050	62·6	93	N. E.	8·80	3·30

Colonial Surgeon's Office,
Malacca, 6th December, 1902.

W. SIDNEY SHEPPARD,
Colonial Surgeon, Malacca.

Perak.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1902.

Districts.	Max-imum in Sun.	Mean Dry Bulb.	Temperature.			Hygrometer.			Total Rainfall	Greatest rain-fall during 24 hours.
			Max-imum.	Min-imum.	Range.	Mean wet Bulb.	Vapour Tension.	Humi-dity.		
Taiping ...	154	79.74	91	70	21	76.44	870	86	44.45	4.23
Kuala Kangsar ...	...	79.23	91	71	20	75.63	839	84	20.91	2.35
Batu Gajah ...	163	80.10	90	71	19	76.50	866	85	21.32	2.10
Gopeng ...	...	79.85	90	65	25	75.92	845	82	15.20	1.45
Ipoh ...	...	79.64	91	70	21	76.08	852	85	17.82	2.21
Kampar ...	...	...	91	70	21	...	...	...	24.44	4.22
Teluk Anson ...	...	79.98	90	70	20	76.67	873	86	25.60	4.12
Tapah ...	..	79.83	91	69	22	76.38	870	85	19.91	2.65
Parit Buntar ...	...	80.82	90	71	19	76.97	875	83	14.35	2.55
Bagan Serai ...	...	80.36	92	69	23	76.16	844	81	22.38	3.25
Selama ...	...	81.25	90	72	18	77.25	882	83	29.08	4.63

STATE SURGEON'S OFFICE,
Taiping, 12th November, 1902.

M. J. WRIGHT,
State Surgeon, Perak.

Selangor.

Abstract of Meteorological Readings in the various Districts of the State, for October, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
General Hospital, Kuala Lumpur	29.888	148.5	80.1	87.7	71.3	16.4	76.1	0.827	73.5	80	Calm	20.89	2.04
Pudoh Gaol Hospital ,, ...	...	...	...	...	...	..	...	...	...	...	...	22.29	2.87
District Hospital ,, ...	...	...	...	...	...	...	...	...	...	...	...	18.18	2.35
,, Klang	...	...	...	84.6	74.5	10.1	...	...	...	...	...	15.34	2.93
,, Kuala Langat	...	...	...	84.0	72.0	12.0	...	...	...	...	...	5.43	1.12
,, Kajang	...	...	...	84.5	75.0	9.5	...	...	...	...	...	16.39	2.43
,, Kuala Selangor	...	...	...	85.4	76.1	9.3	...	...	...	...	...	8.95	1.05
,, Kuala Kubu	...	...	...	89.7	71.6	18.1	...	...	...	...	...	29.11	5.05
,, Serendah	...	...	...	88.2	75.3	12.9	...	...	...	...	...	27.54	3.25
,, Rawang	...	...	...	84.7	75.9	8.8	...	...	...	...	...	14.00	2.75
,, Jeram	...	...	...	...	...	...	...	...	...	...	...	6.94	1.53

State Surgeon's Office,
Kuala Lumpur, 15th *November*, *1902*.

E. A. O. TRAVERS,
State Surgeon, Selangor

Pahang.

Abstract of Meteorological Readings in the various Districts of the State, for November, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Maximum.	Minimum.	Range.	Hygrometer. Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Dist. Hospital, Pekan	...	...	...	87·5	71·	11·5	...	...	...	...	...	12·76	2·85
Kuala Lipis,		...	82·0	94·0	71·0	23·0	...	...	...	...	...	6·91	1·68
Raub,	...	...	80·85	91·0	70·0	17·70	...	...	...	...	...	9·46	2·18
Bentong	...	...	81·0	90·0	72·0	18·0	...	...	...	...	...	14·11	2·45
Kuantan,	...	...	...	85·	73·	12·	...	...	...	...	...	6·59	2·42
Temerloh	...	...	...	91·	70·	21·	...	...	...	...	...	4·77	1·32

Kuala Lipis, 14th November, 1902.

A. ANNESLEY WOODS,
District Surgeon, Pahang.

Muar.

Abstract of Meteorological Readings for November, 1902.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew point.	Humidity.			
Lanadron Estate.	...	...	81·0	92·0	72.5	9·5	74·0	...	...	...	N. E.	18·08	3·70

Muar, 1st December, 1902.

FRANCIS PEARS.